VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a Major Industrial permit. The effluent limitations contained in this permit will maintain the Water Quality Standards (WQS) of 9 VAC 25-260. The discharge results from the treatment of production and sanitary wastewater generated at a pharmaceutical manufacturing facility, non-contact cooling water, and storm water generated in the area around the facility. This permit action consists of reissuing the permit with revisions to the permit, as needed, due to changes in applicable laws, guidance, and available technical information.

1. Facility Name and Address:
   Merck Sharp & Dohme Corp. – Stonewall Plant
   2778 South Eastside Highway
   Elkton, VA 22827
   Location: 2778 South Eastside Highway, Elkton

   SIC Code: 2833 – Medicinal Chemicals & Botanical Products
   2834 – Pharmaceutical Preparations

2. Permit No. VA0002178 Expiration Date: December 31, 2011

3. Owner: Merck Sharp & Dohme Corp., a Division of Merck & Co.
   Contact Name: John A. McCloskey
   Title: Environmental Manager
   Telephone No: 540-298-4122

4. Application Complete Date: July 5, 2011

   Permit Drafted By: Dawn Jeffries Date: September 23, 2011
   Reviewed By: Eric Millard Date: October 4, 2011

   Public Comment Period: November 4, 2011 to December 4, 2011

5. Receiving Stream Name: South Fork Shenandoah River River Mile: 88.09
   Basin: Potomac Subbasin: Shenandoah
   Section: 3 Class: IV
   Special Standards: pH
   Impaired ☑ Yes ☐ No Tidal Waters ☐ Yes ☑ No
   Watershed Name: VAV-B35R South Fork Shenandoah River/Elk Run/Boone Run

6. Operator License Requirements per 9 VAC 25-31-200.C: II

7. Reliability Class per 9 VAC 25-790: N/A

8. Permit Characterization:

   ☑ Private ☐ Federal ☐ State ☐ POTW ☐ PVOTW
   ☐ Possible Interstate Effect ☐ Interim Limits in Other Document (attach copy of CSO)

9. Description of Treatment Works Treating Domestic Sewage: **Appendix A**

   Total Number of Outfalls = 2 external, 2 internal
   Operation and Maintenance (O&M) Manual Approval: May 16, 2011

10. Discharge Location Description and Receiving Waters Information: **Appendix B**

11. Antidegradation Review & Comments per 9 VAC 25-260-30: Tier: 1

    The State Water Control Board's WQS includes an antidegradation policy. All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 waters have water quality that is better than the WQS. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 waters are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

    The antidegradation review begins with a Tier determination. South Fork Shenandoah River below the Merck Sharp & Dohme Corp. – Stonewall Plant discharge has been determined to be a Tier 1 water. This finding is based on the fact that the stream is listed as impaired in the current approved 303(d) list for aquatic life (benthics). Antidegradation baselines are not calculated for Tier 1 waters.

12. Site Inspection: Performed by: Dawn Jeffries Date: June 29, 2011

13. NPDES Permit Rating Worksheet: **Appendix A**
    The worksheet prepared for reissuance of this permit in 2006 was updated using current regarding the facility.
    ☑ Major ☐ Minor Score = 150

14. Effluent Screening and Effluent Limitations: **Appendix C**

15. Effluent Toxicity Testing Requirements included per 9 VAC 25-31-220.D: ☑ Yes ☐ No **Appendix D**

16. Management of Sludge: Sludge from the industrial wastewater treatment plant is dewatered using a belt press, dried with a steam-heated dryer, bagged, and hauled to Rockingham County Landfill for disposal. Sludge from the sewage treatment plant is pumped and hauled by a licensed hauler to North River WWTF for additional treatment and disposal.

17. Permit Changes and Bases for Special Conditions: **Appendix E**

18. Material Storage per 9 VAC 25-31-280.B.2: This permit requires that the facility's O&M Manual include information to address the management of wastes, fluids, and pollutants which may be present at the facility, to avoid unauthorized discharge of such materials.

19. Antibacksliding Review per 9 VAC 25-31-220.L: This permit complies with Antibacksliding provisions of the VPDES Permit Regulation.

20. Impaired Use Status Evaluation per 9 VAC 25-31-220.D: The South Fork Shenandoah River in the immediate vicinity of the discharge is listed as impaired in the current approved 303(d) list for bacteria, aquatic life (benthics), and "Fish Consumption" due to Hg contamination. TMDLs for the bacteria and Hg contamination have been prepared and approved for the segment. This facility was not assigned a wasteload allocation (WLA) in the mercury TMDL because the facility is not known or expected to be a source of mercury contamination. The facility has been assigned an E. coli WLA of 2.09×10^{12} cfu/yr in the bacteria TMDL. A TMDL for the aquatic life impairment has not been prepared. The permit contains a re-opener condition that may allow the permit limits to be modified, in compliance with section 303(d)(4) of the Act once a TMDL is approved.

21. Regulation of Users per 9 VAC 25-31-280.B.9: N/A – There are no industrial users associated with this facility other than the owner.

22. Storm Water Management per 9 VAC 25-31-120: Application Required? ☑ Yes ☐ No
The permittee submitted a Registration Statement for the VPDES General Permit for Storm Water Associated with Industrial Activity. Based on this information, storm water requirements have been continued in the reissued permit.

23. Compliance Schedules per 9 VAC 25-31-250: None required by this permit.

24. Variances/Alternative Limits or Conditions per 9 VAC 25-31-280.B, 100.J, 100.P, and 100.L: None

25. Financial Assurance Evaluation per 9 VAC 25-650-10: N/A – This facility does not serve private residences.

26. Nutrient Trading Regulation per 9 VAC 25-820:
Watershed General Permit (WGP) Required: ☑ Yes ☐ No
If Yes: Permit No.: VAN010007
Date General Permit Effective: January 1, 2007
The annual WLAs (lb/year) for Total Nitrogen (TN) and Total Phosphorus (TP) for Merck & Co., Inc.-Stonewall Plant can be found on the latest Registration List maintained on the DEQ web site at http://www.deq.virginia.gov/export/sites/default/vpdes/pdf/9VAC25-820-RegistrationList-Potomac.pdf.

27. Threatened and Endangered (T&E) Species Screening per 9 VAC 25-260-20 B.8: Because this is not an issuance or reissuance that allows increased discharge flows, T&E screening is not automatically required; however, in accordance with the VPDES Memorandum of Understanding, T&E screening was coordinated through DCR on July 1, 2011 based upon request. Comments were received from DCR on July 25, 2011 and are included in the permit processing file. The comments were forwarded to the permittee.

28. Virginia Environmental Excellence Program (VEEP) Evaluation per § 10.1-1187.1-7: Is this facility considered by DEQ to be a participant in the Virginia Environmental Excellence Program in good standing at either the Exemplary Environmental Enterprise (E3) level or the Extraordinary Environmental Enterprise (E4) level? ☐ Yes ☑ No

29. Public Notice Information per 9 VAC 25-31-290: All pertinent information is on file, and may be inspected and copied by contacting Dawn Jeffries at: DEQ-Valley Regional Office, P.O. Box 3000, Harrisonburg, Virginia 22801, Telephone No. (540) 574-7898, dawn.jeffries@deq.virginia.gov.

    Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing if public response is significant. Requests for public hearings shall state the reason why a hearing is requested, the nature of the issues proposed to be raised in the public hearing and a brief explanation of how the requester's interests would be directly and adversely affected by the proposed permit action. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given.

30. Historical Record:

- Date discharge first commenced: Unknown; the production facility was built at the site in the early 1940s.

- Date permit first issued: January 31, 1975.

- Design flow at issuance: Unknown. A June 6, 1975 letter included a DMR that listed the monthly average discharge flow at Outfall 001 for the month of May 1975 as 7.7 MGD. The average flow for the "last four months" was listed as 9.5 MGD.

- At the 2006 Reissuance, the design average flow for Outfall 101, which included the industrial wastewater treatment plant and the sewage treatment plant, was established as 1.2 MGD. The calculated flow for Outfall 001 was considered to be 10.86 MGD based on the 95th percentile flow over a five-year period (9.66 MGD) of other flows to 001 plus the design flow of Outfall 101. These flows remain unchanged at this reissuance.

APPENDIX A

DESCRIPTION OF TREATMENT WORKS TREATING DOMESTIC SEWAGE

Sanitary wastewater is treated, including disinfection, in a 0.15 MGD above ground package activated sludge plant before comingling with the industrial process wastewater at the head of the 1.2 MGD industrial treatment plant for further treatment before final discharge. Flow from the industrial treatment plant comingles with dechlorinated non-contact cooling water and storm water prior to discharging through Outfall 001. Wastewater treatment units and details on treatment for wastewater are shown in the schematics included in the permit reissuance application.

STP Average Design Flow = 0.15 MGD
Industrial WW Treatment Facility Average Design Flow = 1.2 MGD
Industrial WW Treatment Facility Maximum Design Flow = 2.1 MGD
Industrial Facility Average Flow (March 2009 – February 2011) = 1.0 MGD

VPDES Permit Rating Work Sheet

Facilities identified under SIC Codes 2833 and 2834 have the following characteristics as defined in Appendix A to the NPDES Permit Rating Work Sheet found in the VPDES Permit Manual.

1987 SIC Code	1987 SIC Code Title	40 CFR 439 Sub-Part	Sub-part Title	Human Health Toxicity Number	Total Toxicity Number	Industrial Sub-category Number
2833	MEDICINAL CHEMICALS & BOTANICAL PRODUCTS	A	FERMENTATION PRODUCTS	6	8	3
2833	MEDICINAL CHEMICALS & BOTANICAL PRODUCTS	B	EXTRACTION PRODUCTS	6	8	2
2833	MEDICINAL CHEMICALS & BOTANICAL PRODUCTS	C	CHEMICAL SYNTHESIS PRODUCTS	6	8	1
2833	MEDICINAL CHEMICALS & BOTANICAL PRODUCTS	NR	NON-CONTACT COOLING WATER ONLY	1	1	99
2834	PHARMACEUTICAL PREPARATIONS	D	MIXING/COMPOUNDING-FORMULATION	6	8	0
2834	PHARMACEUTICAL PREPARATIONS	NR	NON-CONTACT COOLING WATER ONLY	1	1	99

Factor 1 – The facility has activities that fall under 40 CFR 439, Subcategories A, C, and D. The highest applicable total toxicity number is selected from the list above. This is unchanged from the previous rating.

Factor 2 – Section A, Type II is selected because the discharge contains process wastewater and non-contact cooling water in the final discharge, and the flow is greater than 10 MGD. This is unchanged from the previous rating.

Factor 3.A. – The permit contains limits for BOD_5. There is a change in the BOD_5 limits, which are based on the application of the Federal Effluent Guidelines for Pharmaceutical Manufacturers. This results in a code change and a score change.

Factor 3.B. – The permit contains limits for TSS. There is a change in the TSS limits, which are based on the application of the Federal Effluent Guidelines for Pharmaceutical Manufacturers. This results in a code change and a score change.

Factor 3.C. – The permit has limits for Ammonia-N. This is unchanged from the previous rating.

Factor 4. – A worst case assumption is made for proximity to public water supplies. The highest Human Health Toxicity Number from the applicable subcategories is obtained from the table above. This is unchanged from the previous rating.

Factor 5.A. – The facility is assigned WLAs for BOD_5 and NH_3 in the Water Quality Management Plan (WQMP) for the Shenandoah River. This is unchanged from the previous rating.

Factor 5.B. – The receiving water is in compliance with applicable WQS for pollutants that are water quality limited in the permit. This is unchanged from the previous rating.

Factor 5.C. – The facility is currently enrolled in a Toxicity Management Plan (TMP) and has passed the established criteria for these tests. This is unchanged from the previous rating.

Factor 6. – Proximity to Near Coastal Waters: Headquarters Priority Permit Indicator (HPRI) Code #4 – This discharge occurs in a non-coastal county. This is unchanged from the previous rating.

NPDES PERMIT RATING WORK SHEET

? Regular Addition
? DiscretionaryAddition
X Score change, but no status change
? Deletion

NPDES NO. **VA0002178**

Facility Name: **Merck Sharp & Dohme Corp. – Stonewall Plant**

City: **Elkton, VA**

Receiving Water: **South Fork Shenandoah River**

Reach Number: _____

Is this facility a steam electric power plant (SIC=4911) with one or more of the following characteristics?
1. Power output 500 MW or greater (not using a cooling pond/lake)
2. A nuclear power plant
3. Cooling water discharge greater than 25% of the receiving stream's 7Q10 flow rate
? YES; score is 600 (stop here) ☑ NO (continue)

Is this permit for a municipal separate storm sewer serving a population greater than 100,000?

? YES; score is 700 (stop here)
☑ NO (continue)

FACTOR 1: Toxic Pollutant Potential

PCS SIC Code: _____ Primary SIC Code: 2833 Other SIC Codes: 2834
Industrial Subcategory Code: 003 (Code 000 if no subcategory)

Determine the Toxicity potential from Appendix A. Be sure to use the TOTAL toxicity potential column and check one)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
[ ] No process waste streams			[ ] 3.	3	15	[ ] 7.	7	35
[ ] 1.	1	5	[ ] 4.	4	20	[X] 8.	8	40
[ ] 2.	2	10	[ ] 5.	5	25	[ ] 9.	9	45
			[ ] 6.	6	30	[ ] 10.	10	50

Code Number Checked : 8

Total Points Factor 1: 40

FACTOR 2: Flow/Stream Flow Volume (*Complete either Section A or Section B; check only one)*

Section A X Wastewater Flow Only Considered

Wastewater Type (See Instructions)		Code	Points
Type I: Flow < 5 MGD	?	11	0
Flow 5 to 10 MGD	?	12	10
Flow > 10 to 50 MGD	?	13	20
Flow > 50 MGD	?	14	30
Type II: Flow < 1 MGD	?	21	10
Flow 1 to 5 MGD	?	22	20
Flow > 5 to 10 MGD	?	23	30
Flow > 10 MGD	X	24	50
Type III: Flow < 1 MGD	?	31	0
Flow 1 to 5 MGD	?	32	10
Flow > 5 to 10 MGD	?	33	20
Flow > 10 MGD	?	34	30

Section B ? Wastewater and Stream Flow Considered

Wastewater Type (See Instructions)	Percent of Instream Wastewater Concentration at Receiving Stream Low Flow		Code	Points
Type I/III:	< 10 %	?	41	0
	10 % to < 50 %	?	42	10
	> 50 %	?	43	20
Type II:	< 10 %	?	51	0
	10 % to <50 %	?	52	20
	> 50 %	?	53	30

Code Checked from Section A or B: 24

Total Points Factor 2: 50

FACTOR 3: Conventional Pollutants

(only when limited by the permit)

A. Oxygen Demanding Pollutant: (check one) X BOD ? COD ? Other:_____

			Code	*Points*
Permit Limits: (check one)	?	< 100 lbs/day	1	0
	?	100 to 1000 lbs/day	2	5
	?	> 1000 to 3000 lbs/day	3	15
	X	> 3000 lbs/day	4	20

Code Checked: 4

Points Scored: 20

B. Total Suspended Solids (TSS)

			Code	*Points*
Permit Limits: (check one)	?	< 100 lbs/day	1	0
	?	100 to 1000 lbs/day	2	5
	X	> 1000 to 5000 lbs/day	3	15
	?	> 5000 lbs/day	4	20

Code Checked: 3

Points Scored: 15

C. Nitrogen Pollutant: (check one) X Ammonia ? Other: _____

		Nitrogen Equivalent	*Code*	*Points*
Permit Limits: (check one)	?	< 300 lbs/day	1	0
	X	300 to 1000 lbs/day	2	5
	?	> 1000 to 3000 lbs/day	3	15
	?	> 3000 lbs/day	4	20

Code Checked: 2

Points Scored: 5

Total Points Factor 3: 40

FACTOR 4: Public Health Impact

Is there a public drinking water supply located within 50 miles downstream of the effluent discharge (this includes any body of water to which the receiving water is a tributary)? A public drinking water supply may include infiltration galleries, or other methods of conveyance that ultimately get water from the above referenced supply.

X YES (If yes, check toxicity potential number below)

? NO (If no, go to Factor 5)

Determine the *human health* toxicity potential from Appendix A. Use the same SIC code and subcategory reference as in Factor 1. (Be sure to use the human health toxicity group column ? check one below)

Toxicity Group	Code	Points	Toxicity Group	Code	Points	Toxicity Group	Code	Points
? No process waste streams	0	0	? 3.	3	0	? 7.	7	15
? 1.	1	0	? 4.	4	0	? 8.	8	20
? 2.	2	0	? 5.	5	5	? 9.	9	25
			X 6.	6	10	? 10.	10	30

Code Number Checked: 6

Total Points Factor 4: 10

FACTOR 5: Water Quality Factors

A. Is (or will) one or more of the effluent discharge limits based on water quality factors of the receiving stream (rather than technology-based federal effluent guidelines, or technology-based state effluent guidelines), or has a wasteload allocation been assigned to the discharge:

		Code	Points
X	Yes	1	10
?	No	2	0

B. Is the receiving water in compliance with applicable water quality standards for pollutants that are water quality limited in the permit?

		Code	Points
X	Yes	1	0
?	No	2	5

C. Does the effluent discharged from this facility exhibit the reasonable potential to violate water quality standards due to whole effluent toxicity?

		Code	Points
?	Yes	1	10
X	No	2	0

Code Number Checked: A 1 B 1 C 2

Points Factor 5: A 10 + B 0 + C 0 = 10 TOTAL

FACTOR 6: Proximity to Near Coastal Waters

A. Base Score: Enter flow code here (from Factor 2): 24 *Enter the multiplication factor that corresponds to the flow code:* 1.0

Check appropriate facility HPRI Code (from PCS):

	HPRI#	*Code*	*HPRI Score*
?	1	1	20
?	2	2	0
?	3	3	30
X	4	4	0
?	5	5	20

HPRI code checked: 4

Flow Code	*Multiplication Factor*
11, 31, or 41	0.00
12, 32, or 42	0.05
13, 33, or 43	0.10
14 or 34	0.15
21 or 51	0.10
22 or 52	0.30
23 or 53	0.60
24	1.00

Base Score: (HPRI Score) 0 X (Multiplication Factor) 1.0 = 0 (TOTAL POINTS)

B. Additional Points ? NEP Program
For a facility that has an HPRI code of 3, does the facility discharge to one of the estuaries enrolled in the National Estuary Protection (NEP) program (see instructions) or the Chesapeake Bay?

N/A

		Code	Points
?	Yes	1	10
?	No	2	0

C. Additional Points ? Great Lakes Area of Concern
For a facility that has an HPRI code of 5, does the facility discharge any of the pollutants of concern into one of the Great Lakes' 31 areas of concern (see Instructions)

N/A

		Code	Points
?	Yes	1	10
?	No	2	0

Code Number Checked: A 4 B N/A C N/A -

Points Factor 6: A 0 + B 0 + C 0 = 0 TOTAL

SCORE SUMMARY

Factor	Description	Total Points
1	Toxic Pollutant Potential	40
2	Flows/Streamflow Volume	50
3	Conventional Pollutants	40
4	Public Health Impacts	10
5	Water Quality Factors	10
6	Proximity to Near Coastal Waters	0
	TOTAL (Factors 1 through 6)	150

S1. Is the total score equal to or greater than 80? X Yes (Facility is a major) ? No

S2. If the answer to the above questions is no, would you like this facility to be discretionary major?

? No

? Yes (Add 500 points to the above score and provide reason below:

Reason:

NEW SCORE: 150

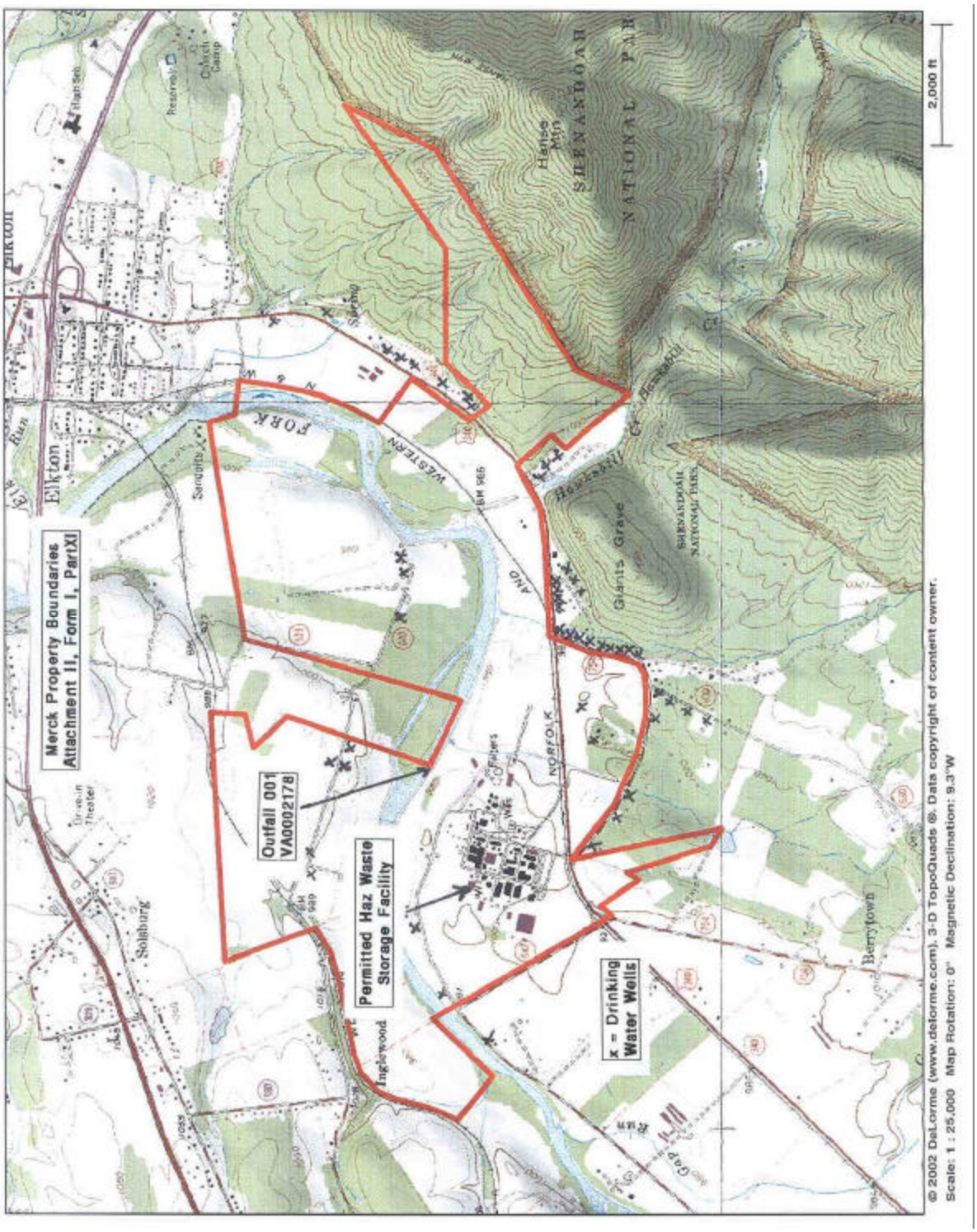
OLD SCORE: 155

Dawn Jeffries
Permit Writer's Name
540-574-7898
Phone Number
August 23, 2011
Date

APPENDIX B

DISCHARGE LOCATION DESCRIPTION AND RECEIVING WATERS INFORMATION

This facility discharges to the South Fork Shenandoah River in Rockingham County. The locations of the facility and Outfall 001 are shown on the topographic map below.



PLANNING INFORMATION

Relevant points of interest within the watershed and in the vicinity of the discharge are shown on the following Water Quality Assessment TMDL Review and corresponding map.

WATER QUALITY ASSESSMENTS REVIEW
POTOMAC-SHENANDOAH RIVER BASIN
6/14/2011

IMPAIRED SEGMENTS

SEGMENT ID	STREAM	SEGMENT START	SEGMENT END	SEGMENT LENGTH	PARAMETER
B32R-02-HG	South River/SF Shenandoah/NF S	163.27	8.16	155.11	Mercury in Fish Tissue
B33R-01-BAC	South Fork Shenandoah River	100.97	41.98	58.99	Fecal Coliform
B33R-01-BEN	South Fork Shenandoah River	100.97	41.98	58.99	Benthic
B35R-01-BAC	Boone Run	13.08	0.00	13.08	Fecal Coliform
B35R-02-BAC	Quail Run	5.54	0.00	5.54	E-coli, Fecal Coliform
B35R-02-BEN	Quail Run	4.26	0.00	4.26	Benthic
B35R-03-BEN	Quail Run	5.54	4.26	1.28	Benthic

PERMITS

PERMIT	FACILITY	STREAM	RIVER MILE	LAT	LONG	WBID
VA0002178	**Merck Sharp & Dehome Corp. - S**	**S.F. Shenandoah River**	**88.09**	**382316**	**0783841**	**VAV-B35R**
VA0024732	Massanutten Public Service STP	Quail Run	5.07	382418	0784246	VAV-B35R
VA0026433	Elkton STP	S.F. Shenandoah River	85.07	382437	0783807	VAV-B35R
VA0072931	McGaheysville STP	S.F. Shenandoah River	93.17	382055	0784225	VAV-B35R
VA0073245	MillerCoors Brewing Co. - Shenand	S.F. Shenandoah River	92.38	382120	0784143	VAV-B35R
VA0073245	MillerCoors Brewing Co. - Shenand	Gap Run X-Trib	0.56	382106	0784026	VAV-B35R

MONITORING STATIONS

STREAM	NAME	RIVER MILE	RECORD	LAT	LONG
Hawksbill Creek	1BHKL002.23	2.23	5/1/96	382221	0783623
Quail Run	1BQAL004.47	4.47	10/1/96	382418	0784200
Quail Run	1BQAL004.89	4.89	10/1/96	382419	0784245
Quail Run	1BQAL005.09	5.1	10/1/96	382418	0784248
Quail Run	1BQAL005.04	5.04		382419	0784244
S.F. Shenandoah River	1BSSF086.12	86.12	5/4/06	382355	0783736
Quail Run	1BQAL004.30	4.3	07/01/97	382418	0784200
Boone Run	1BBON000.60	0.6	07/01/91	382601	0783809
Quail Run	1BQAL005.29	5.29	07/01/97	382417	0784303
S.F. Shenandoah River	1BSSF092.46	92.46	07/01/99	382117	0784146
S.F. Shenandoah River	1BSSF093.74	93.74	7/1/99	382032	0784250
S.F. Shenandoah River	1BSSF085.08	85.08	9/23/99	382433	78387.
S.F. Shenandoah River	1BSSF088.20	88.2	3/19/02	382318	0783847
S.F. Shenandoah River	1BSSF092.69	92.69	9/23/99	382112	0784159
Cub Run	1BCBR000.03	0.03	2/20/02	382024	784326
Big Run	1BBGR000.42	0.42	7/2001	381957	784305
Quail Run	1BQAL004.82	4.82			
Quail Run	1BQAL004.96	4.96			
Boone Run	1BBON001.46	1.46	7/2003	382515	0783821

PUBLIC WATER SUPPLY INTAKES

OWNER	STREAM	RIVER MILE
None		

WATER QUALITY MANAGEMENT PLANNING REGULATION

Is this discharge addressed in the WQMP regulation? **Yes**

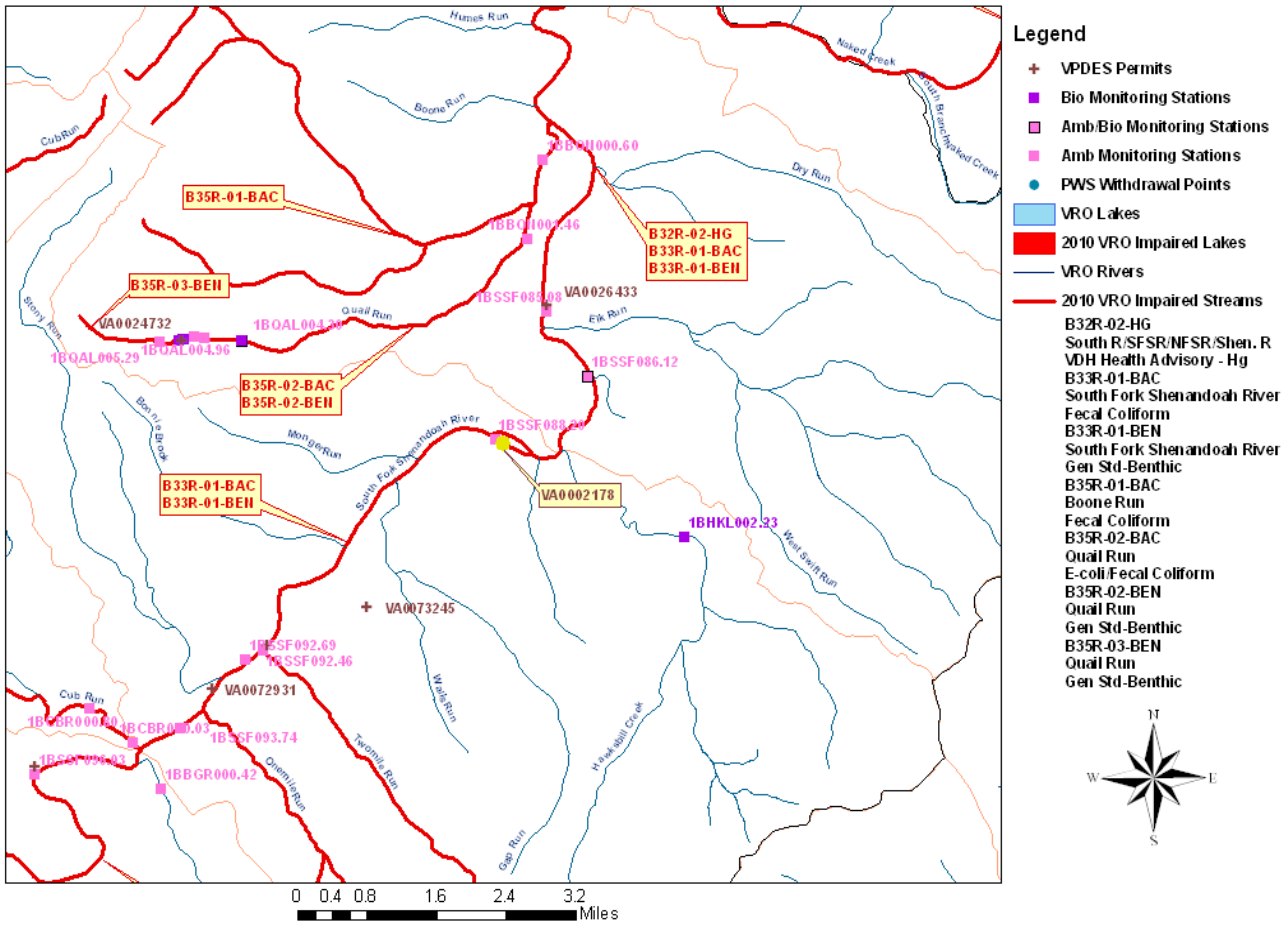
If Yes, what effluent limitations or restrictions does the WQMP regulation impose on this discharge?

PARAMETER	ALLOCATION
BOD5	1570 kg/d
NH3	645.9 kg/c
Nutrients under the Watershed General Permit	

WATERSHED NAME

VAV-B35R South Fork Shenandoah River/Elk Run/Boone Run

Merck Sharp & Dehome Corp. - Stonewall Plant - Water Quality Assessments Review
June 14, 2011



MEMORANDUM
DEPARTMENT OF ENVIRONMENTAL QUALITY
VALLEY REGIONAL OFFICE

4411 Early Road – P.O. Box 3000 Harrisonburg, VA 22801

SUBJECT: Flow Frequency Determination
Merck and Company, Inc.–Stonewall Plant – VPDES Permit No. VA0002178, Rockingham County

TO: Permit Processing File

FROM: Dawn Jeffries

DATE: March 17, 2011

This memo supersedes Eric Aschenbach's flow frequency determination dated October 14, 2003.

The Merck and Company, Inc.–Stonewall Plant discharges to the South Fork Shenandoah River near Elkton, Virginia. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit reissuance.

The VDEQ has operated a continuous record gage on the South Fork Shenandoah River near Lynwood, VA (#01628500) since 1930. The gage is located approximately 10 miles upstream of the discharge point in Rockingham County, VA. The flow frequencies for the gage and the discharge point are presented below. There are no known withdrawals located between the gage and the discharge point. The values at the discharge point were determined by drainage area proportions and do not address any discharges or springs lying between the gage and the discharge point. The drainage area for the discharge point will be the value determined by Law Engineering in their 1993 DEQ-approved stream model. This is the same value that was utilized by the permit writer in the previous permit action to revise the flow frequency values.

South Fork Shenandoah River near Lynnwood, VA (#01628500):

Drainage Area = 1079 mi^2

1Q30 =	113 cfs	High Flow 1Q10 =	219 cfs
1Q10 =	139 cfs	High Flow 7Q10 =	240 cfs
7Q10 =	147 cfs	High Flow 30Q10 =	285 cfs
30Q10 =	162 cfs	HM =	479 cfs
30Q5 =	188 cfs		

South Fork Shenandoah River at discharge point:

Drainage Area = 1246 mi^2

1Q30 =	130 cfs	(84.0 mgd)	High Flow 1Q10 =	253 cfs	(164 mgd)
1Q10 =	160 cfs	(103 mgd)	High Flow 7Q10 =	277 cfs	(179 mgd)
7Q10 =	170 cfs	(110 mgd)	High Flow 30Q10 =	329 cfs	(213 mgd)
30Q10 =	187 cfs	(121 mgd)	HM =	553 cfs	(357 mgd)
30Q5 =	217 cfs	(140 mgd)			

The high flow months are January through May.

REVIEWER: KAS
DATE: 3-17-11

EFFLUENT STREAM MIXING EVALUATION

A diffuser on Outfall 001 was designed to provide complete mixing within 600 feet downstream of the outfall; therefore, no mixing zone analysis was conducted for this facility.

MEMORANDUM
DEPARTMENT OF ENVIRONMENTAL QUALITY
VALLEY REGIONAL OFFICE

4411 Early Road – P.O. Box 3000 Harrisonburg, VA 22801

SUBJECT: Site Visit for Reissuance of VPDES Permit No. VA0002178, Merck & Co., Inc. - Stonewall Facility, Rockingham County

TO: Permit Processing File

FROM: Dawn Jeffries

DATE: June 30, 2011

On June 29, 2011 the writer performed a site visit at the subject facility. Photos of the external outfalls are shown below.

Outfall location 001 (submerged diffuser)

Outfall 002

APPENDIX C

EFFLUENT SCREENING AND EFFLUENT LIMITATIONS

EFFLUENT LIMITATIONS

A comparison of technology and water quality-based limits was performed, and the most stringent limits were selected. The selected limits are summarized in the table below.

Outfall 001 **Final Limits** **Calculated Flow: 10.86 MGD**

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITS		MONITORING REQUIREMENTS	
		Monthly Average	Maximum	Frequency	Sample Type
Flow (MGD)	1	NL	NL	Continuous	TIRE
BOD_5	1	NL (mg/L)	NL (mg/L)	1/Month	24 HC
		NL (kg/d)	NL (kg/d)		
TSS	1	NL (mg/L)	NL (mg/L)	1/Month	24 HC
		NL (kg/d)	NL (kg/d)		
COD	1	NL (mg/L)	NL (mg/L)	1/Month	24 HC
		NL (kg/d)	NL (kg/d)		
Ammonia-N	1	NL (mg/L)	NL (mg/L)	1/Month	24 HC
		NL (kg/d)	NL (kg/d)		
Total Kjeldahl Nitrogen (as N)(kg/d)	1,6	1291	2600	1/Month	24 HC
Total Cyanide	1,4	2.8 (kg/d)	0.26 (mg/L)	1/Week	Grab
Effluent Chlorine (TRC)(mg/L)*	2	0.087	0.18	1/Day	Grab
---	---	Minimum	Maximum	---	---
pH (S.U.)	2,5	6.5	9.0	Continuous	Recorded
Temperature (°C)	3,6	NA	37	Continuous	Recorded
Dissolved Oxygen (mg/L)	2,3	4.5	NA	1/Day	Grab

NL = *No Limitation, monitoring required*
NA = *Not Applicable*
TIRE = *Totalizing, Indicating, and Recording (electronic and/or paper)Equipment*
24 HC = *24 Hour composite sample*
* = *Applicable regardless of form of disinfection used*

Bases for Effluent Limitations

1. Best Professional Judgment (BPJ)
2. Water Quality Standards
3. 2011 ECS, LLC, stream modeling report
4. 1993 Law Environmental, Inc. stream modeling report.
5. Federal Effluent Guideline Limitations for the Pharmaceutical Manufacturing Category, 40 CFR Parts 136 and 439
6. Limit carried forward based on 9 VAC 25-31-220.L

Outfall No. 101 (Internal Outfall) **Final Limits** **Average Design Flow: 1.2 MGD**

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITS		MONITORING REQUIREMENTS	
		Monthly Average	Maximum	Frequency	Sample Type
Flow (MGD)	2	NL	NL	Continuous	TIRE
BOD_5 (kg/d)	1	990	2700	1/Week	24 HC
TSS (kg/d)	1	1700	3400	1/Week	24 HC
COD (kg/d)	1	3400	6600	1/Week	24 HC
Ammonia-N (kg/d)	1	130	380	1/Week	24 HC
Acetone (kg/d)	1	0.91	2.3	1/6 Months	24 HC
Acetonitrile (kg/d)	1	46	110	1/6 Months	24 HC
n-Amyl Acetate (kg/d)	1	2.3	5.9	1/6 Months	24 HC
Amyl Alcohol (kg/d)	1	19	45	1/6 Months	24 HC
Benzene (kg/d)	1	0.091	0.23	1/6 Months	24 HC
n-Butyl Acetate (kg/d)	1	2.3	5.9	1/6 Months	24 HC
Chlorobenzene (kg/d)	1	0.27	0.68	1/6 Months	24 HC
Chloroform (kg/d)	1	0.059	0.091	1/6 Months	24 HC
o-Dichlorobenzene (kg/d)	1	0.27	0.68	1/6 Months	24 HC
1,2-Dichloroethane (kg/d)	1	0.45	1.8	1/6 Months	24 HC
Diethylamine (kg/d)	1	460	1100	1/6 Months	24 HC
Dimethyl Sulfoxide (kg/d)	1	170	420	1/6 Months	24 HC
Ethanol (kg/d)	1	19	45	1/6 Months	24 HC
Ethyl Acetate (kg/d)	1	2.3	5.9	1/6 Months	24 HC
n-Heptane (kg/d)	1	0.091	0.23	1/6 Months	24 HC
n-Hexane (kg/d)	1	0.091	0.14	1/6 Months	24 HC
Isobutyraldehyde (kg/d)	1	2.3	5.4	1/6 Months	24 HC
Isopropanol (kg/d)	1	7.3	18	1/6 Months	24 HC
Isopropyl Acetate (kg/d)	1	2.3	5.9	1/6 Months	24 HC
Isopropyl Ether (kg/d)	1	12	38	1/6 Months	24 HC
Methanol (kg/d)	1	19	45	1/6 Months	24 HC
Methyl Cellosolve (kg/d)	1	180	450	1/6 Months	24 HC
Methylene Chloride (kg/d)	1	1.4	4.1	1/6 Months	24 HC
Methyl Formate (kg/d)	1	2.3	5.9	1/6 Months	24 HC
MIBK (kg/d)	1	0.91	2.3	1/6 Months	24 HC
Phenol (kg/d)	1	0.091	0.23	1/6 Months	24 HC
Tetrahydrofuran (kg/d)	1	12	38	1/6 Months	24 HC
Toluene (kg/d)	1	0.091	0.27	1/6 Months	24 HC
Triethylamine (kg/d)	1	460	1100	1/6 Months	24 HC
Xylenes (kg/d)	1	0.045	0.14	1/6 Months	24 HC

TIRE = Totalizing, Indicating, and Recording *NL = No Limit, monitoring required* *24 HC = 24-Hour composite sample*

Bases for Effluent Limitations

1. Federal Effluent Guideline Limitations (FEGL) for the Pharmaceutical Manufacturing Category, 40 CFR Part 439
2. Facility Design Flow
3. All limits are expressed to two significant figures.

Outfall No. 102 (Internal Outfall) **Final Limits** **Design Flow = 0.150 MGD**

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITS		MONITORING REQUIREMENTS	
		Monthly Average	Maximum	Frequency	Sample Type
Flow (MGD)	1	NL	NL	Continuous	TIRE
E. coli (geometric mean)[a]	2	126 N/100 mL	NA	4/Month between 10 am and 4 pm	Grab
E. coli (geometric mean)[b]	2	126 N/100 mL	NA	3/Week between 10 am and 4 pm	Grab
---	---	Minimum	Maximum	---	---
Contact Chlorine (TRC)[a,c]	1	1.0 mg/L	NA	3/Day at 4-hr intervals	Grab

TIRE = Totalizing, Indicating, and Recording
NL = No Limit, monitoring required
NA = Not Applicable
4/Month = 4 samples taken weekly during the calendar month
3/Week = 3 samples taken during the calendar week, no less than 48 hours apart

Bases for Effluent Limitations
1. Best Professional Judgment (BPJ)
2. Water Quality Standards

Footnotes:
a - Applicable only if chlorination is used for disinfection.
b - Applicable only if alternative to chlorination is used for disinfection (e.g. Ultraviolet (UV) radiation).
c - Sampling interval for TRC-Contact is the minimum requirement and can be increased if additional staffing is available. Deviation from the prescribed samp ling interval must be acknowledged in the O&M Manual. TRC-Contact, or E. coli, is to be sampled at the end of the Chlorine Contact Tank prior to mixing with any process water.

LIMITING FACTORS – OVERVIEW:
The following potential limiting factors have been considered in developing this permit and fact sheet:

Water Quality Management Plan Regulation (9 VAC 25-720)	
A. TMDL limits	E. coli
B. Non-TMDL WLAs	BOD_5, Ammonia-N
C. CBP (TN & TP) WLAs	TN and TP by coverage under VAN010007
Federal Effluent Guidelines	TSS, pH, BOD_5, COD, Ammonia-N, Cyanide, plus 30 other regulated parameters from 40 CFR Part 439
BPJ/Agency Guidance limits	TKN, TRC (contact), Temperature
Water Quality-based Limits - numeric	DO, TRC (effluent), E. coli, pH, Ammonia-N, Cyanide plus 30 other regulated parameters from 40 CFR Part 439
Water Quality-based Limits - narrative	None
Toxics Management Plan (TMP)	See Appendix D
Storm Water Limits	Industry general special conditions required
VPDES Individual Permit Regulation	Flow
VPDES General Permit Regulations	None

EVALUATION OF THE EFFLUENT – CONVENTIONAL POLLUTANTS
This discharge was previously modeled with the most recent model addendum prior to this reissuance being submitted in 1998. To ensure protection of water quality in the South Fork Shenandoah River, the discharge for this facility was remodeled at this reissuance by ECS, LLC Mid-Atlantic and a stream modeling report was submitted to the DEQ. Model results indicate that the limits developed below and applied to this permit are protective of instream water quality downstream of the discharge. The modeling information is maintained in the DEQ receiving stream DO model file.

Process wastewater, discharged through Outfall 001 via Outfall 101, is subject to three categories of the EPA Effluent Limitation Guidelines (ELG) as found in 40 CFR Part 439 for the Pharmaceutical Manufacturing Point Source Category: Subpart A (Fermentation Products), Subpart C (Chemical Synthesis Products), and Subpart D (Mixing/Compounding and Formulation). These three subparts prescribe BPT/BCT/BAT limits for BOD_5, TSS, COD, Cyanide, and pH as shown in Table 1 and BAT limits for additional parameters as shown in Table 2.

Table 1 - Summary of BPT/BCT/BAT, Most Restrictive EGLs for BOD5, TSS, COD, Cyanide, and pH*

Subpart	BOD_5 (kg/d) Monthly Avg	TSS (kg/d) Monthly Avg	COD (mg/L) Daily Max	COD Monthly Avg	Cyanide (mg/L) Daily Max	Cyanide (mg/L) Monthly Avg
A-40 CFR 439.12	90% Reduction of Influent LTA load x 3 (variability factor)	1.7 x BOD_5 limitation	1675	The lower of 856 mg/L or the concentration showing a 74% reduction of Influent LTA load x 2.2 (var. factor)	33.5	9.4
C-40 CFR 439.32	90% Reduction of Influent LTA load x 3 (variability factor)	1.7 x BOD_5 limitation	1675	The lower of 856 mg/L or the concentration showing a 74% reduction of Influent LTA load x 2.2 (var. factor)	33.5	9.4
D-40 CFR 439.42	90% Reduction of Influent LTA load x 3 but not less than 45 mg/L	1.7 x BOD_5 limitation	228	The lower of 86 mg/L or the concentration showing a 74% reduction of Influent LTA load x 2.2 (var. factor)	NA	NA

*pH requirement for all subparts is within the range of 6-9 at all times

Table 2 - Summary of Additional BAT EGLs*

Regulated Parameter	Daily Maximum (mg/L)	Monthly Average (mg/L)
Ammonia (as N)	84.1	29.4
Acetone	0.5	0.2
4-Methyl-2-pentanone (MIBK)	0.5	0.2
Isobutyraldehyde	1.2	0.5
n-Amyl acetate	1.3	0.5
n-Butyl acetate	1.3	0.5
Ethyl acetate	1.3	0.5
Isopropyl acetate	1.3	0.5
Methyl formate	1.3	0.5
Amyl alcohol	10.0	4.1
Ethanol	10.0	4.1
Isopropanol	3.9	1.6
Methanol	10.0	4.1
Methyl Cellosolve	100.0	40.6
Dimethyl Sulfoxide	91.5	37.5
Triethylamine	250.0	102.0
Phenol	0.05	0.02
Benzene	0.05	0.02
Toluene	0.06	0.02
Xylenes	0.03	0.01
n-Hexane	0.03	0.02
n-Heptane	0.05	0.02
Methylene chloride	0.9	0.3
Chloroform	0.02	0.013
1,2-Dichloroethane	0.4	0.1
Chlorobenzene	0.15	0.06
o-Dichlorobenzene	0.15	0.03
Tetrahydrofuran	8.4	2.6
Isopropyl ether	8.4	2.6
Diethylamine	250.0	102.0
Acetonitrile	25.0	10.2

*Apply only to Subpart A & C wastewater

Table 3 – Distribution of facility flows by Subparts

Description	Average GPD	Flow Ratios
Subpart A	258,708	30% of process WW
Subpart C	474,299	55% of process WW
Subpart D	129,354	15% of process WW
Total process wastewater	862,361	83% of outfall flow
Total non-process wastewater	177,639	17% of outfall flow
Total effluent flow (LTA)	1,040,000	NA

Table 4 – LTA Daily Influent Loads

Year	BOD (kg/d)	COD (kg/d)
2006	2896	6513
2007	2895	6457
2008	3287	7393
2009	2658	5908
2010	2212	4825

BOD_5:
EPA Guidelines: Using the equation in Table 1 above; (3287 kg/d) (0.10) (3) = 986 kg/d for the monthly average limit (MAL). Guidelines do not establish a corresponding daily maximum limit (DML), and that value has historically been set at twice the MAL per BPJ. Following that procedure; (2) (986 kg/d) = 1972 kg/d for the DML. However, due to the projected introduction of new products at this site (within the same subparts), the facility is expected to increase its influent load variability during the coming permit term while not significantly increasing its LTA load. Therefore, the permittee has requested that the DML be calculated based on doubling the result of the above reduction equation, when calculated using the 95 percentile influent load rather than the LTA load; (2) (7000 kg/d) (0.3) (3) = 4200 kg/d. Due to this request and the changes it is based upon, the permit writer concluded that a reduction of influent loads would be more useful in determining a DML than an analysis of previous effluent values. Therefore the permit writer proposes that a method consistent with EPA's FEGLs statistical approach would be to calculate the DML based on a 90% reduction of the 99 percentile of daily influent data values rather than their LTA, but without doubling that result. The 99 percentile for BOD is 9000 kg/d; therefore (9000 kg/d) (0.10) (3) = 2700 kg/d.

Water Quality Management Plan: The current WQMP specifies a year-round BOD_5 WLA for this facility of 1570 kg/d.

Current Permit: Limits of 3100 kg/d (DML) and 1567 kg/d (MAL) were included. Limits are given at Outfall 001.

2011 Permit: More stringent limits of 2700 kg/d (DML) and 990 kg/d (MAL) have been included at Outfall 101 based upon BPJ and FEGLs, respectively. Agency guidelines on using two significant digits were also observed. Limits at Outfall 001 have been removed since the limits at Outfall 101 are more stringent and the only source for the pollutant at Outfall 001 is from Outfall 101. Monitoring is required weekly at Outfall 101 and monthly at Outfall 001. These limits are more conservative than those found to be protective in the stream model.

TSS:
EPA Guidelines: The calculation (1.7) (986 kg/d) = 1676 kg/L for the MAL. Guidelines do not establish a corresponding daily maximum limit (DML). However, that value has historically been set at 2 x the MAL per BPJ. Following that procedure; (2) (1676 kg/d) = 3352 kg/d for the DML.

Water Quality Management Plan: Not specified

Current Permit: Limits of 5300 kg/d (DML) and 2700 kg/d (MAL) were included. Limits are given at Outfall 101.

2011 Permit: Limits of 3400 kg/d (DML) and 1700 kg/d (MAL) have been included at Outfall 101. Monitoring is required weekly at Outfall 101 and monthly at outfall 001.

COD:
EPA Guidelines: For MALs, COD must be limited at the most restrictive value based on a comparison of a 74% reduction of the influent load and given allowable concentrations per subpart.

MAL 74% reduction loadings: Using the equation in Table 1 above: (7393 kg/d) (0.26) (2.2) = 4229 kg/d for the monthly average limit (MAL). This corresponds to a concentration of 931 mg/L for a 1.2 MGD flow. Guidelines do not establish a corresponding daily maximum limit (DML). However, the DML has historically been set at 2 x the MAL per BPJ. Following that procedure; (2) (4229 kg/d) = 8458 kg/d and 1862 mg/L.

MAL concentration-based loadings: (0.85) (856 mg/L) + (0.15) (86 mg/L) = 740.5 mg/L
(740.5 mg/L) (1.2 MGD) (3.785) = 3363 kg/d
DML concentration-based loadings: (0.85) (1675 mg/L) + (0.15) (228 mg/L) = 1457.95 mg/L
(1457.95 mg/L) (1.2 MGD) (3.785) = 6622 kg/d

Water Quality Management Plan: Not specified.

Current Permit: Limits of 6400 kg/d (DML) and 3200 kg/d (MAL) were included. Limits are given at Outfall 101. Reduced monitoring frequencies have been carried forward.

2011 Permit: The most stringent concentrations of 740.5 mg/L and 1457.95 mg/L have been used with a flow of 1.2 MGD for limits calculations. Limits of 6600 kg/d (DML) and 3400 kg/d (MAL) have been included based upon calculations using the FEGL concentration based limits and rounded to 2 significant digits. Limits are given at Outfall 101. Monitoring is required weekly at Outfall 101 and monthly at Outfall 001.

TKN:
EPA Guidelines: None

Water Quality Management Plan: Not specified.

Current Permit: Limits of 2600 kg/d (DML) and 1291 kg/d (MAL) were included. These are based on the year-round TKN WLA of 1291 kg/d from the WQMP. Limits are given at Outfall 001.

2011 Permit: Limits of 2600 kg/d (DML) and 1291 kg/d (MAL) have been carried forward based on antibacksliding. Because the TKN WLA was removed in the 2004 WQMP Revision of the Potomac-Shenandoah Basin, the monitoring frequency has been reduced from 1/Week to 1/Month. These limits are identical to those found to be protective in the stream model.

Ammonia-N:
EPA Guidelines: FEGLs limit this parameter at the concentrations shown in Table 2 above. These concentrations applied to the flow from the applicable categories result in loads of 340 kg/d (DML) and 130 kg/d (MAL).

Water Quality Management Plan: The current WQMP specifies a year-round Ammonia-N WLA for this facility of 645.9 kg/d.

Current Permit: Limits of 380 kg/d (DML) and 130 kg/d (MAL) were included. Limits are given at Outfall 101.

2011 Permit: Limits of 380 kg/d (DML) and 130 kg/d (MAL) have been included based on FEGLs and are given at Outfall 101. These limits are more stringent than both the WLA in the WQMP and those required by the evaluation of toxic parameters (see page C-17). Monitoring is required weekly at Outfall 101 and monthly at Outfall 001.

D.O.:
EPA Guidelines: None

Water Quality Management Plan: Not specified

Current Permit: There is a D.O. Daily Minimum limit of 4.5 mg/L. The limit is given at Outfall 001.

2011 Permit: Based on the model run at this reissuance, the D.O. Daily Minimum limit of 4.5 mg/L has been carried forward.

pH:
EPA Guidelines: For Part 439, the EPA Guidelines require a final effluent pH in the range 6.0-9.0 S.U.

Water Quality Management Plan: Not specified

Current Permit: The permit requires pH at Outfall 001 to be within the range of 6.5-9.0 S.U. based upon federal guidelines and the WQS of the receiving stream.

2011 Permit: The current pH requirements have been continued in the reissued permit.

Nutrients:
EPA Guidelines: None

Water Quality Management Plan: Nutrients addressed under the watershed general permit.

Current Permit: None.

2011 Permit: In accordance with § 62.1-44.19:14.C.5. of the Code of Virginia, this Significant Discharger has submitted a Registration Statement and DEQ has recognized that they are covered under the General Virginia Pollutant Discharge Elimination System (VPDES) Watershed Permit Regulation for Total Nitrogen and Total Phosphorus Discharges and Nutrient Trading in the Chesapeake Bay Watershed in Virginia (9 VAC 25-820-10 *et seq.*). The need for nutrient concentration limits in this permit has been evaluated. Concentration limits for nitrogen and phosphorus are not included since the plant has not expanded nor was existing technology installed to meet any effluent limit requirements and the basis of design was not a defined concentration at the end of the pipe.

Prior to a facility expansion, the permittee must demonstrate that sufficient WLAs have been acquired to offset any increase in the delivered TN and delivered TP loads. The CER requirement and the permit reopener condition ensure that the facility will receive appropriate concentration limits when necessary for expanded or upgraded facilities based on the treatment technology proposed.

Cyanide:
Background: WQS-based limits for Total Cyanide, initially imposed in the 1994 permit reissuance, were based on an approved modeling report submitted by Law Environmental in 1993. The 1994 permit limits were as follows:

MAL = 2.93 kg/d
DML = 0.29 mg/L

The above MAL represents the 97 Percentile concentration limit (0.077 mg/L), calculated to achieve a LTA concentration of 0.052 mg/L in the effluent, converted to a loading value using the 1994 Maximum 30-Day Flow of 10.07 MGD (Form 2C). The DML equals the 99.79 Percentile concentration limit, calculated to achieve an average LTA effluent concentration of 0.12 mg/L. The model concluded that these limits would protect the instream chronic WQS at the edge of the mixing zone of 600' based on diffuser design, and the instream acute WQS at the edge of a 15' zone of initial dilution. The MAL was applied as a concentration and the DML as a mass load due to Department guidance at that time to have both mass and concentration limits for water quality-based limits.

Since the 1994 permit, cyanide limits in this permit have been based on maintaining the same CN concentrations in the receiving stream as was determined as protective in the 1993 model and applied in the 1994 permit.

EPA Guidelines: The technology requirements for cyanide are shown in Table 1 above. Monitoring for cyanide should occur after cyanide destruction and before commingling with other waste streams unless cyanide is detectable at the end-of-pipe location and compliance at the in-plant location can be sufficiently determined.

Water Quality Management Plan: Not specified

Current Permit: The current permit requires weekly cyanide monitoring at Outfall 001 with a MAL of 2.9 kg/d and a DML of 0.27 mg/L. These limits are based on a calculated outfall flow of 10.86 MGD, a stream flow of 114 MGD, and a continuation of the instream cyanide concentrations allowed by the 1993 model.

2011 Permit: The following procedure has been used to calculate cyanide limits at permit reissuances since 1994. Since there has been no change in the acute and chronic Water Quality Criteria (WQC) for CN used in the 1993 Law Environmental model, this was deemed an acceptable approach (per BPJ).

MAL: The 1994 Total Cyanide 97 Percentile MAL concentration (0.077 mg/L) and 2C Maximum 30-Day Flow (10.07 MGD) were completely mixed with a receiving stream 7Q10 of 116.6 MGD and a 0 mg/L background concentration as follows:

[(10.07*0.077)+(116.6*0)]/(10.07+116.6) = 0.006121 mg/L

That resulting 1994 instream Total Cyanide concentration was then converted back to a mass MAL using the new stream 7Q10 (110 MGD) and the effluent flow of 10.86 MGD as follows:

MAL = 0.006121*(10.86+110)*3.785 = 2.8 kg/d

DML: The 1994 Total Cyanide 99.79 Percentile DML concentration (0.29 mg/L) and 2C Maximum 30-Day Flow (10.07 MGD) were completely mixed with a receiving stream 7Q10 of 116.6 MGD and a 0 mg/L background concentration as follows:

[(10.07*0.29)+(116.6*0)]/(10.07+116.6) = 0.02305 mg/L

That resulting in-stream Total Cyanide concentration was then converted back to a concentration DML using the new stream 7Q10 (110 MGD) and the new calculated flow of 10.86 MGD as follows:

DML = 0.02305*(10.86+110)/10.86 = 0.26 mg/L

The Total Cyanide MAL and DML has been applied in the reissued permit as follows:

MAL = 2.8 kg/d
DML = 0.26 mg/L

These proposed CN limits are based on maintaining the same CN concentrations in the receiving stream as was allowed under previous permits. Due to this, antibacksliding provisions have been met. These limits for Total Cyanide are more restrictive than those required by the EPA Guidelines. The combination of mass and concentration limits has also been carried forward based on BPJ.

A monitoring frequency of 1/Week for sampling this parameter has been carried forward for this parameter. A review of three years of effluent data suggests that the ratio of the composite average to the current Monthly Average Limit continues to be less than 25% of the limit. The sampling location for cyanide at Outfall 001 is also carried forward since sampling results there are quantifiable in spite of dilution and the limits are based on the more restrictive instream WQS and not effluent guidelines.

EVALUATION OF THE EFFLUENT – DISINFECTION

E. coli limits have been included at Outfall 102 based on current Department guidance for major facilities. These limits reflect the current WQS for E. coli in the receiving stream and comply with the TMDL WLA of 2.09×10^{12} cfu/yr. Based on the use of chlorination for disinfection, E. coli monitoring is required 4/Month to demonstrate compliance with the limit. If an alternate disinfection method is utilized, the required monitoring frequency is 3/Week.

EVALUATION OF THE EFFLUENT – TOXIC POLLUTANTS

Receiving Stream Data

Water quality data for the receiving stream were obtained from Ambient Monitoring Station No. 1BSSF100.10 on the South Fork Shenandoah River at the Rte 708 Bridge.

Stream Parameter	Value	Units
Mean Hardness (as $CaCO_3$) =	142	mg/L
90^{th} Percentile Temperature (Annual) =	24	ºC
90^{th} Percentile Temperature (Wet season*) =	19	ºC
90^{th} Percentile Maximum pH =	8.5	SU
10^{th} Percentile Maximum pH =	7.8	SU

Outfall 001 Effluent Data

The pH and temperature values were obtained from the daily operational data submitted by the permittee. The hardness value was carried forward from the previous fact sheet.

Effluent Parameter	Value	Units
Mean Hardness (as $CaCO_3$) =	123	mg/L
90^{th} Percentile Temperature (Annual) =	28	ºC
90^{th} Percentile Temperature (Wet season*) =	26	ºC
90^{th} Percentile Maximum pH =	8.78	SU
10^{th} Percentile Maximum pH =	7.84	SU

* Wet Season = January through May

WQC and WLAs were calculated for the WQS parameters for which data are available. Those WQC and WLAs are presented in this appendix. The effluent data were analyzed per the protocol for evaluation of effluent toxic pollutants included in this appendix with the following results:

- TRC: Monthly average and maximum daily maximum limits are required for this discharge. These limits are more restrictive than the previous limits but a compliance schedule does not appear to be necessary. Effluent chlorine limits are specified in the permit at Outfall 001 regardless of the disinfection method chosen due to other sources of chlorine in the treatment process; therefore, no TRC effluent limits are included at Outfall 102.

- Ammonia-N: Limits are required for this facility based on FEGLs and the FEGL limits are more stringent than those indicated by WQS. The required limits are applied at Outfall 101.

- Cyanide: Limits are required for this facility based on WQS and the water-quality-based limits are more stringent than those indicated by FEGLs. The required limits are applied at Outfall 001.

- Additional monitoring data is needed for two pollutants due to the lack of effluent quality data. The permittee must monitor the effluent at Outfall 001 for the substances noted in Attachment A of the permit once after the start of the third year from the permit's effective date.

WATER QUALITY CRITERIA / WASTE LOAD ALLOCATION ANALYSIS

Facility Name: Merck & Co., Inc.
Receiving Stream: S.F. Shenandoah River
Permit No.: VA0002178
Date: 10/6/2011
Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information			Stream Flows			Mixing Information				Effluent Information		
Mean Hardness (as CaCO3) =	142	mg/L	1Q10 (Annual) =	103	MGD	Annual	- 1Q10 Flow =	100	%	Mean Hardness (as CaCO3) =	123	mg/L
90% Temperature (Annual) =	24	deg C	7Q10 (Annual) =	110	MGD		- 7Q10 Flow =	100	%	90% Temp (Annual) =	28	deg C
90% Temperature (Wet season) =	19	deg C	30Q10 (Annual) =	121	MGD		- 30Q10 Flow =	100	%	90% Temp (Wet season) =	26	deg C
90% Maximum pH =	8.5	SU	1Q10 (Wet season) =	164	MGD	Wet Season	- 1Q10 Flow =	100	%	90% Maximum pH =	8.78	SU
10% Maximum pH =	7.8	SU	30Q10 (Wet season) =	213	MGD		- 30Q10 Flow =	100	%	10% Maximum pH =	7.84	SU
Tier Designation =	1		30Q5 =	140	MGD					Current Discharge Flow =	10.860	MGD
Public Water Supply (PWS) Y/N? =	N		Harmonic Mean =	357	MGD					Discharge Flow for Limit Analysis =	10.860	MGD
V(alley) or P(iedmont)? =	V											
Trout Present Y/N? =	N											
Early Life Stages Present Y/N? =	Y											

Footnotes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise.
2. All flow values are expressed as Million Gallons per Day (MGD).
3. Discharge volumes are highest monthly average or 2C maximum for Industries and design flows for Municipals.
4. Hardness expressed as mg/l CaCO3. Standards calculated using Hardness values in the range of 25-400 mg/l CaCO3.
5. "Public Water Supply" protects for fish & water consumption. "Other Surface Waters" protects for fish consumption only.
6. Carcinogen "Y" indicates carcinogenic parameter.
7. Ammonia WQSs selected from separate tables, based on pH and temperature.
8. Metals measured as Dissolved, unless specified otherwise.
9. WLA = Waste Load Allocation (based on standards).
10. WLA = Waste Load Allocation (based on standards).
11. WLAs are based on mass balances (less background, if data exist).
12. Acute - 1 hour avg. concentration not to be exceeded more than 1/3 years.
13. Chronic - 4 day avg. concentration (30 day avg. for Ammonia) not to be exceeded more than 1/3 years.
14. Mass balances employ 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, and Harmonic Mean for Carcinogens. Actual flows employed are a function of the mixing analysis and may be less than the actual flows.
15. Effluent Limitations are calculated elsewhere using the minimum WLA and EPA's statistical approach (Technical Support Document).

~~Facility Name:~~ Merck & Co., Inc.
Receiving Stream: S.F. Shenandoah River
Permit No.: VA0002178
Date: 9/2/2011

		WATER QUALITY CRITERIA (10.860 MGD Discharge Flow - Mix per "Mixer")				NON-ANTIDEGRADATION WASTE LOAD ALLOCATIONS (10.860 MGD Discharge - Mix per "Mixer")		
		Aquatic Protection		Human Health		Aquatic Protection		Human
Toxic Parameter and Form	Carcinogen?	Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic	Health
Ammonia-N (Annual)	N	3.1E+00 mg/L	5.6E-01 mg/L	None	None	3.2E+01 mg/L	6.8E+00 mg/L	N/A
Antimony	N	None	None	5.6E+00	6.4E+02	N/A	N/A	8.9E+03
Benzene	Y	None	None	2.2E+01	5.1E+02	N/A	N/A	1.7E+04
Chlorine, Total Residual	N	1.9E-02 mg/L	1.1E-02 mg/L	None	None	2.0E-01 mg/L	1.2E-01 mg/L	N/A
Chlorobenzene	N	None	None	1.3E+02	1.6E+03	N/A	N/A	2.2E+04
Chloroform	N	None	None	3.4E+02	1.1E+04	N/A	N/A	1.5E+05
Copper	N	1.8E+01	1.2E+01	1.3E+03	None	1.9E+02	1.3E+02	N/A
Cyanide, Free	N	2.2E+01	5.2E+00	1.4E+02	1.6E+04	2.3E+02	5.8E+01	2.2E+05
1,2-Dichlorobenzene	N	None	None	4.2E+02	1.3E+03	N/A	N/A	1.8E+04
1,2-Dichloroethane	Y	None	None	3.8E+00	3.7E+02	N/A	N/A	1.3E+04
Methylene Chloride	Y	None	None	4.6E+01	5.9E+03	N/A	N/A	2.0E+05
Phenol	N	None	None	1.0E+04	8.6E+05	N/A	N/A	1.2E+07
Toluene	N	None	None	5.1E+02	6.0E+03	N/A	N/A	8.3E+04
Tributyltin	N	4.6E-01	7.2E-02	None	None	4.8E+00	8.0E-01	N/A

PROTOCOL FOR THE EVALUATION OF EFFLUENT TOXIC POLLUTANTS

Toxic pollutants were evaluated in accordance with OWP Guidance Memo No. 00-2011. Acute and Chronic Waste Load Allocations (WLA_a and WLA_c) were analyzed according to the protocol below using a statistical approach (STAT.exe) to determine the necessity and magnitude of limits. Human Health Waste Load Allocations (WLA_{hh}) were analyzed according to the same protocol through a simple comparison with the effluent data. If the WLA_{hh} exceeded the effluent datum or data mean, no limits were required. If the effluent datum or data mean exceeded the WLA_{hh}, the WLA_{hh} was imposed as the limit.

Since there are no data available for any toxic pollutants immediately upstream of this discharge, all upstream (background) pollutant concentrations are assumed to be "0".

The steps used in evaluating the effluent data are as follows:

A. If all data are reported as "below detection" or < the required Quantification Level (QL), and at least one detection level is = the required QL, then the pollutant is considered to be not significantly present in the discharge and no further monitoring is required.

B. If all data are reported as "below detection", and all detection levels are > the required QL, then an evaluation is performed in which the pollutant is assumed present at the lowest reported detection level.

   B.1. If the evaluation indicates that no limits are needed, then the existing data set is adequate and no further monitoring is required.

   B.2. If the evaluation indicates that limits are needed, then the existing data set is inadequate to make a determination and additional monitoring is required.

C. If any data value is reported as detectable at or above the required QL, then the data are adequate to determine whether effluent limits are needed.

   C.1. If the evaluation indicates that no limits are needed, then no further monitoring is required.

   C.2. If the evaluation indicates that limits are needed, then the limits and associated requirements are specified in the draft permit.

   C.3. (Exception for Metals data only) If the evaluation indicates that limits are needed, but the data are reported as a form other than "Dissolved" (except for Selenium), then the existing data set is inadequate to make a determination and additional monitoring is required.

Parameter	CASRN	Type	QL (µg/L)	Data (µg/L unless noted otherwise)	Source of Data	Data Eval
Acenapthene	83-32-9	B	10.0	<0.4	a	A
Acrolein	107-02-8	V	---	<10	a	A
Acrylonitrile [C]	107-13-1	V	---	<10	a	A
Aldrin [C]	309-00-2	P	0.05	<0.0027	a	A
Ammonia-N (mg/L)	766-41-7	X	0.2 mg/L	More stringent FEGLs apply at Outfall 101	a	C.2
Anthracene	120-12-7	B	10.0	<0.2	a	A
Antimony, dissolved	7440-36-0	M	0.2	<0.3	a	B.1
Arsenic, dissolved	7440-38-2	M	1.0	<0.95	a	A
Benzene [C]	71-43-2	V	10.0	<0.9	a	A
Benzidine [C]	92-87-5	B	---	<24	a	A
Benzo (a) anthracene [C]	56-55-3	B	10.0	<0.2	a	A
Benzo (b) fluoranthene [C]	205-99-2	B	10.0	<0.4	a	A
Benzo (k) fluoranthene [C]	207-08-9	B	10.0	<0.4	a	A
Benzo (a) pyrene [C]	50-32-8	B	10.0	<0.4	a	A
Bis2-Chloroethyl Ether [C]	111-44-4	B	---	<0.5	a	A
Bis2-Chloroisopropyl Ether	108-60-1	B	---	<0.4	a	A
Bis (2-ethylhexyl) Phthalate [C]	117-81-7	B	10.0	<1	a	A
Bromoform [C]	75-25-2	V	10.0	<0.8	a	A
Butylbenzylphthalate	85-68-7	B	10.0	<0.9	a	A
Cadmium, dissolved	7440-43-9	M	0.3	<0.2	a	A
Carbon Tetrachloride [C]	56-23-5	V	10.0	<1	a	A
Chlordane [C]	57-74-9	P	0.2	<0.068, <0.096	a	A
Chloride (mg/L)	16887-00-6	X	---	Previously evaluated, no further monitoring required.	---	---
TRC (mg/L)	7782-50-5	X	0.1 mg/L	0.2	a	C.2
Chlorobenzene	108-90-7	V	50.0	<0.8	a	A
Chlorodibromomethane [C]	124-48-1	V	10.0	<1	a	A
Chloroform	67-66-3	V	10.0	<1	a	A
2-Chloronaphthalene	91-58-7	B	---	<0.2	a	A
2-Chlorophenol	95-57-8	A	10.0	<0.4	a	A
Chlorpyrifos	2921-88-2	P	---	Previously evaluated, no further monitoring required.	---	---
Chromium III, dissolved	16065-83-1	M	0.5	Previously evaluated, no further monitoring required.	---	---
Chromium VI, dissolved	18540-29-9	M	0.5	Previously evaluated, no further monitoring required.	---	---
Chrysene [C]	218-01-9	B	10.0	<0.2	a	A
Copper, dissolved	7440-50-8	M	0.5	5.8	a	C.1
Cyanide, Free	57-12-5	X	10.0	Limited at Outfall 001 based on 1993 Law Environ. model	b	C.2
DDD [C]	72-54-8	P	0.1	<0.0068	a	A
DDE [C]	72-55-9	P	0.1	<0.0068	a	A
DDT [C]	50-29-3	P	0.1	<0.0068	a	A
Demeton	8065-48-3	P	---	Previously evaluated, no further monitoring required.	---	---
Diazinon	333-41-5	P	---	**NEW REQUIREMENT. Needs to be sampled.**	---	---
Dibenz(a,h)anthracene [C]	53-70-3	B	20.0	<0.5	a	A
1,2-Dichlorobenzene	95-50-1	B	10.0	<0.4	a	A

Parameter	CASRN	Type	QL (µg/L)	Data (µg/L unless noted otherwise)	Source of Data	Data Eval
1,3-Dichlorobenzene	541-73-1	B	10.0	<0.4	a	A
1,4-Dichlorobenzene	106-46-7	B	10.0	<0.4	a	A
3,3-Dichlorobenzidine [C]	91-94-1	B	---	<0.9	a	A
Dichlorobromomethane [C]	75-27-4	V	10.0	<0.7	a	A
1,2-Dichloroethane [C]	107-06-2	V	10.0	<1	a	A
1,1-Dichloroethylene	75-35-4	V	10.0	<0.9	a	A
1,2-trans-dichloroethylene	156-60-5	V	---	<1	a	A
2,4-Dichlorophenol	120-83-2	A	10.0	<0.4	a	A
1,2-Dichloropropane [C]	78-87-5	V	---	<1	a	A
1,3-Dichloropropene [C]	542-75-6	V	---	Trans - <0.6; Cis - <1	a	A
Dieldrin [C]	60-57-1	P	---	<0.0070	a	A
Diethyl Phthalate	84-66-2	B	10.0	Previously evaluated, no further monitoring required.	---	---
2,4-Dimethylphenol	105-67-9	A	10.0	<0.4	a	A
Dimethyl Phthalate	131-11-3	B	---	<1	a	A
Di-n-Butyl Phthalate	84-74-2	B	10.0	<0.6	a	A
2,4-Dinitrophenol	51-28-5	A	---	<12	a	A
2-Methyl-4,6-Dinitrophenol	534-52-1	A	---	<5	a	A
2,4-Dinitrotoluene [C]	121-14-2	B	10.0	<0.5	a	A
1,2-Diphenylhydrazine [C]	122-66-7	B	---	<0.2	a	A
Alpha-Endosulfan (syn = Alpha-Endosulfan I)	959-98-8	P	0.1	<0.0070	a	A
Beta-Endosulfan (syn = Alpha-Endosulfan II)	33213-65-9	P	0.1	<0.015	a	A
Alpha-Endosulfan + Beta-Endosulfan		P	---	Previously evaluated, no further monitoring required.	---	---
Endosulfan Sulfate	1031-07-8	P	0.1	<0.0068	a	A
Endrin	72-20-8	P	0.1	<0.0096	a	A
Endrin Aldehyde	7421-93-4	P	---	<0.027	a	A
Ethylbenzene	100-41-4	V	10.0	<0.8	a	A
Fluoranthene	206-44-0	B	10.0	<0.4	a	A
Fluorene	86-73-7	B	10.0	<0.4	a	A
Guthion	86-50-0	P	---	Previously evaluated, no further monitoring required.	---	---
Heptachlor [C]	76-44-8	P	0.05	<0.0036	a	A
Heptachlor Epoxide [C]	1024-57-3	P	---	<0.0036	a	A
Hexachlorobenzene [C]	118-74-1	B	---	<1	a	A
Hexachlorobutadiene [C]	87-68-3	B	---	<0.9	a	A
Hexachlorocyclohexane Alpha-BHC [C]	319-84-6	P	---	<0.0044	a	A
Hexachlorocyclohexane Beta-BHC [C]	319-85-7	P	---	<0.0067	a	A
Hexachlorocyclohexane Gamma-BHC [C] (syn. = Lindane)	58-89-9	P	---	<0.0034	a	A
Hexachlorocyclopentadiene	77-47-4	B	---	<2	a	A
Hexachloroethane [C]	67-72-1	B	---	<0.5	a	A
Hydrogen Sulfide	7783-06-4	X	---	Previously evaluated, no further monitoring required.	---	---
Indeno (1,2,3-cd) pyrene [C]	193-39-5	B	20.0	<0.4	a	A
Isophorone [C]	78-59-1	B	10.0	<0.4	a	A
Kepone	143-50-0	P	---	Previously evaluated, no further monitoring required.	---	---

Parameter	CASRN	Type	QL (µg/L)	Data (µg/L unless noted otherwise)	Source of Data	Data Eval
Lead, dissolved	7439-92-1	M	0.5	Previously evaluated, no further monitoring required.	---	---
Malathion	121-75-5	P	---	Previously evaluated, no further monitoring required.	---	---
Mercury, dissolved	7439-97-6	M	1.0	<0.046	a	A
Methyl Bromide	74-83-9	V	---	Previously evaluated, no further monitoring required.	---	---
Methylene Chloride [C]	75-09-2	V	20.0	<2	a	A
Methoxychlor	72-43-5	P	---	Previously evaluated, no further monitoring required.	---	---
Mirex	2385-85-5	P	---	Previously evaluated, no further monitoring required.	---	---
Nickel, dissolved	7440-02-0	M	0.5	Previously evaluated, no further monitoring required.	---	---
Nitrobenzene	98-95-3	B	10.0	<0.6	a	A
N-Nitrosodimethylamine [C]	62-75-9	B	---	<0.5	a	A
N-Nitrosodiphenylamine [C]	86-30-6	B	---	<0.4	a	A
N-Nitrosodi-n-propylamine [C]	621-64-7	B	---	<0.5	a	A
Nonylphenol	104-40-51	A	---	**NEW REQUIREMENT. Needs to be sampled.**	---	---
Parathion	56-38-2	P	---	Previously evaluated, no further monitoring required.	---	---
PCB Total [C]	1336-36-3	p	---	Previously evaluated, no further monitoring required.	---	---
Pentachlorophenol [C]	87-86-5	A	50.0	<4	a	A
Phenol	108-95-2	A	10.0	<15	a	B.1
Pyrene	129-00-0	B	10.0	<0.2	a	A
Selenium, total recoverable	7782-49-2	M	2.0	<0.25	a	A
Silver, dissolved	7440-22-4	M	0.2	<0.080	a	A
1,1,2,2-Tetrachloroethane [C]	79-34-5	V	---	<1	a	A
Tetrachloroethylene [C]	127-18-4	V	10.0	<1	a	A
Thallium, dissolved	7440-28-0	M	---	<0.15	a	A
Toluene	108-88-3	V	10.0	<0.8	a	A
Toxaphene [C]	8001-35-2	P	5.0	<1.4	a	A
Tributyltin	60-10-5	P	---	97 ng/l	a	C.1
1,2,4-Trichlorobenzene	120-82-1	B	10.0	<0.4	a	A
1,1,2-Trichloroethane [C]	79-00-5	V	---	<1	a	A
Trichloroethylene [C]	79-01-6	V	10.0	<1	a	A
2,4,6-Trichlorophenol [C]	88-06-2	A	10.0	<0.8	a	A
Vinyl Chloride [C]	75-01-4	V	10.0	<2	a	A
Zinc, dissolved	7440-66-6	M	2.0	Previously evaluated, no further monitoring required.	---	---

"Type" column indicates a category assigned to the referenced substance (see below):
A = Acid Extractable Organic Compounds
B = Base/Neutral Extractable Organic Compounds
M = Metals
p = PCBs
P = Pesticides
R = Radionuclides
V = Volatile Organic Compounds
X = Miscellaneous Compounds and Parameters

"Source of Data" codes:
a = data from permittee monitoring

"Data Evaluation" codes:
See section titled PROTOCOL FOR THE EVALUATION OF EFFLUENT TOXIC POLLUTANTS for an explanation of the code used.

The **superscript "C"** following the parameter name indicates that the substance is a known or suspected carcinogen; human health criteria at risk level 10^{-5}.
CASRN = Chemical Abstract Service Registry Number for each parameter is referenced in the current Water Quality Standards. A unique numeric identifier designating only one substance. The Chemical Abstract Service is a division of the American Chemical Society.

STAT.EXE Results

Ammonia-N
Chronic averaging period = 30
WLAa = 32
WLAc = 6.8
Q.L. = 0.2
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:
observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 13.7201566352309
Average Weekly limit = 13.7201566352309
Average Monthly Limit = 13.7201566352309

The data are: 9

TRC
Chronic averaging period = 4
WLAa = 0.2
WLAc = 0.12
Q.L. = 0.1
# samples/mo. = 30
# samples/wk. = 7

Summary of Statistics:
observations = 1
Expected Value = .2
Variance = .0144
C.V. = 0.6
97th percentile daily values = .486683
97th percentile 4 day average = .332758
97th percentile 30 day average= .241210
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 0.175508974086388
Average Weekly limit = 0.107184595324212
Average Monthly Limit = 8.69859620059178E-02

The data are: 0.2

Tributylin
Chronic averaging period = 4
WLAa = 4.8
WLAc = 0.8
Q.L. = 0.09
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:
observations = 1
Expected Value = .097
Variance = .003387
C.V. = 0.6
97th percentile daily values = .236041
97th percentile 4 day average = .161387
97th percentile 30 day average= .116987
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 0.097

Copper
Chronic averaging period = 4
WLAa = 190
WLAc = 130
Q.L. = 0.1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:
observations = 1
Expected Value = 5.8
Variance = 12.1104
C.V. = 0.6
97th percentile daily values = 14.1138
97th percentile 4 day average = 9.64998
97th percentile 30 day average= 6.99510
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 5.8

COMPARISON OF TECHNOLOGY AND WATER QUALITY-BASED LIMITS – Outfall 101

For the remaining parameters with effluent guideline limitations, the following table was used to compare the calculated technology-based limits and the water quality-based limits, and the most stringent limit was applied to the permit. The method of comparison was as follows:

1) WQS, if applicable, were applied at Outfall 001 to determine chronic and acute WLAs at the point the final effluent enters the river. STATS.EXE was used to generate potential limits for those parameters from the WLAs. For parameters with only human health WLAs, the WLA_{HH} was considered as a chronic limit.
2) As applicable, water quality-based concentration limits for internal Outfall 101 were back-calculated from Outfall 001 limits based on the LTA flow at Outfall 001 (10.86 MGD) and the design flow at Outfall 101 (1.2 MGD).
3) These calculated Outfall 101 concentrations were compared to those required by EGLs, and the most stringent concentration for each parameter was selected to be used for calculating mass limits.
4) Mass limits were calculated as follows: The concentration determined above was multiplied by the design average flow for Outfall 101 (1.2 MGD) and the conversion factor of 3.785. Limits have been applied in the permit at Outfall 101 except for cyanide. Design flow rather than the LTA flow of 1.04 MGD was used based on permittee request due to flow variability. This is consistent with the development of the previous permit.
5) Acute limits were applied as daily maximums and chronic limits were applied as monthly averages.
6) Federal Regulations do not regulate the parameters below for Subcategory D. Based on the Pharmaceutical Development Document, EPA 821-R-98-005, page 11-5, Subcategory D flow was considered in the following calculations with the same concentrations contained in the Subcategory A & C BAT regulations.

Max Mo Avg flow (MGD) at 001:	10.86	MGD										
Design flow (MGD) at 101:	1.2	MGD										
PARAMETER	**101 acute limit** based on EGLs (mg/l)	**101 chronic limit** based on EGLs (mg/l)	**001 acute limit** based on WQS (mg/l)	**001 chronic limit** based on WQS (mg/l)	**001 HH WLA** based on WQS (mg/l)	**101 acute limit** based on 001 WLA (mg/l)	**101 chronic limit** based on 001 WLA (mg/l)	**101 HH limit** based on 001 WLA (mg/l)	**Most Restrictive Acute Limit** Daily Max (mg/l)	**Most Restrictive Chronic Limit** Monthly Avg (mg/l)	**101 Mass Limit** Daily Max (kg/d)	**101 Mass Limit** Mo Avg (kg/d)
Ammonia as N	84.1	29.4	13.72	13.72	NA	124.166	124.166	NA	84.1	29.4	382	134
Acetone	0.5	0.2	NA	NA	NA	NA	NA	NA	0.5	0.2	2.3	0.91
Acetonitrile	25	10.2	NA	NA	NA	NA	NA	NA	25	10.2	114	46
n-Amyl Acetate	1.3	0.5	NA	NA	NA	NA	NA	NA	1.3	0.5	5.9	2.3
Amyl Alcohol	10	4.1	NA	NA	NA	NA	NA	NA	10	4.1	45	19
Benzene	0.05	0.02	NA	NA	17	NA	NA	153.85	0.05	0.02	0.23	0.091
n-Butyl Acetate	1.3	0.5	NA	NA	NA	NA	NA	NA	1.3	0.5	5.9	2.3
Chlorobenzene	0.15	0.06	NA	NA	22	NA	NA	199.1	0.15	0.06	0.68	0.27
Chloroform	0.02	0.013	NA	NA	150	NA	NA	1357.5	0.02	0.013	0.091	0.059
Cyanide*	33.5	9.4	0.26	0.0061	220	2.353	0.055	1991	2.4	0.055	*	*
o-Dichlorobenzene	0.15	0.06	NA	NA	18	NA	NA	162.9	0.15	0.06	0.68	0.27
1,2 Dichloroethane	0.4	0.1	NA	NA	13	NA	NA	117.65	0.4	0.1	1.8	0.45
Diethylamine	250	102	NA	NA	NA	NA	NA	NA	250	102	1136	463
Dimethyl Sulfoxide	91.5	37.5	NA	NA	NA	NA	NA	NA	91.5	37.5	416	170
Ethanol	10	4.1	NA	NA	NA	NA	NA	NA	10	4.1	45	19
Ethyl Acetate	1.3	0.5	NA	NA	NA	NA	NA	NA	1.3	0.5	5.9	2.3
n-Heptane	0.05	0.02	NA	NA	NA	NA	NA	NA	0.05	0.02	0.23	0.091
n-Hexane	0.03	0.02	NA	NA	NA	NA	NA	NA	0.03	0.02	0.14	0.091
Isobutyraldehyde	1.2	0.5	NA	NA	NA	NA	NA	NA	1.2	0.5	5.45	2.3
Isopropanol	3.9	1.6	NA	NA	NA	NA	NA	NA	3.9	1.6	18	7.3
Isopropyl Acetate	1.3	0.5	NA	NA	NA	NA	NA	NA	1.3	0.5	5.9	2.3
Isopropyl Ether	8.4	2.6	NA	NA	NA	NA	NA	NA	8.4	2.6	38	12
Methanol	10	4.1	NA	NA	NA	NA	NA	NA	10	4.1	45	19
Methyl Cellosolve	100	40.6	NA	NA	NA	NA	NA	NA	100	40.6	454	184
Methylene Chloride	0.9	0.3	NA	NA	200	NA	NA	1810	0.9	0.3	4.1	1.4
Methyl Formate	1.3	0.5	NA	NA	NA	NA	NA	NA	1.3	0.5	5.9	2.3
MIBK	0.5	0.2	NA	NA	NA	NA	NA	NA	0.5	0.2	2.3	0.91
Phenol	0.05	0.02	NA	NA	12,000	NA	NA	108600	0.05	0.02	0.23	0.091
Tetrahydrofuran	8.4	2.6	NA	NA	NA	NA	NA	NA	8.4	2.6	38	12
Toluene	0.06	0.02	NA	NA	83	NA	NA	751.15	0.06	0.02	0.27	0.091
Triethylamine	250	102	NA	NA	NA	NA	NA	NA	250	102	1136	463
Xylenes	0.03	0.01	NA	NA	NA	NA	NA	NA	0.03	0.01	0.14	0.045
* Limits based on WQS continue to be more restictive. Limits are applied at outfall 001 for this parameter as detailed on pages 8 & 9 this appendix.												

APPENDIX D

RATIONALE FOR WHOLE EFFLUENT TOXICITY (WET) REQUIREMENTS

Applicability of WET Requirements: The applicability criteria for a facility to perform toxicity testing are contained in the Departments Guidance Memo No. 00-2012, Toxics Management Program Implementation Guidance, 08/24/00, Part IV. WET requirements apply to this facility because the Standard Industrial Codes (SIC) for Merck & Co., Inc. are 2833 and 2834 which are included in Appendix A of the TMP Guidance.

Summary of Toxicity Testing: The current permit requires annual acute and chronic testing using *Ceriodaphnia dubia*. Tables 1 and 2 contain a summary of the toxicity testing results during the term of the permit. These data were evaluated using the procedures outlined in the TMP guidance.

Calculation of WLAs: WLAs were generated from the Department's WETLim10.xls spreadsheet by entering the facility flow, stream flows, and a 100% stream mix based on the use of a diffuser (See Table 3).

Chronic Dilution Series: The recommended dilution series is 100%, 39%, 15%, 5.8%, 2.3%. The midpoint of the dilution series is 15%, equivalent to a TUc of 6.66. The midpoint of the dilution series is derived from the highest anticipated mean of the data expressed as Chronic Toxicity Unit (TU_c) that will not trigger a limit in the Department's Stat.exe program.

Stat.exe Limit Evaluation: The WLAs are used in the Department's Stat.exe program in order to perform a statistical evaluation of the acute and chronic test results expressed as Toxicity Units (TUs). The toxicity data are analyzed separately by species and test type (acute or chronic).

Chronic Stat.exe Limit Evaluation:
The summary of the chronic toxicity testing data are shown in Table 2. The results of the Stat.exe evaluation are shown in Table 5. Based on the evaluation of the chronic toxicity data, a WET limit is not required at this time; therefore, compliance monitoring shall be continued on an annual basis.

Acute Stat.exe Limit Evaluation:
The summary of the acute toxicity testing data are shown in Table 1. The results of the Stat.exe evaluation are shown in Table 5. Based on the evaluation of the acute toxicity data, a WET limit is not required at this time; therefore, compliance monitoring shall be continued on an annual basis.

Midpoint Check Stat.exe Evaluation:
The midpoint of the chronic test dilution series (Table 4) was evaluated using Stat.exe to determine if limits would be inappropriately triggered (Table 5). The midpoint was entered as a chronic Toxicity Unit (TUc). Since no limit was triggered by the midpoint, the recommended dilution series can be used without the need for adjustment.

The more-sensitive species was determined to be *Ceriodaphnia dubia* at the 2007 permit reissuance. This has been carried forward in this reissuance. The frequency of testing has been continued as annually. Since quarterly testing at the beginning of the previous permit term identified August as being the period of apparent toxicity, and the testing period was established as August-September. This has been carried forward in this reissuance.

Reviewer: BWC
Date: 7/20/11

Table 1
Summary of Acute Toxicity Testing (LC_{50})

Monitoring Period (August-September)	Test Date	48-Hr. Static Acute *Ceriodaphnia dubia* (TUa)	48-Hr. Static Acute *Ceriodaphnia dubia* (% Survival in 100% Effluent)
1st Annual	Aug - Sep 2007	1.4	0%
2nd Annual	Aug - Sep 2008	<1.0	100%
3rd Annual	Aug - Sep 2009	<1.0	100%
4th Annual	Aug - Sep 2010	<1.0	100%
5th Annual	Aug - Sep 2011	1.19	40%

Table 2
Summary of Chronic Toxicity Testing

Monitoring Period	Test Date	Chronic 3-Brood Static Renewal Survival and Reproduction, *Ceriodaphnia dubia*		48-hr LC_{50}	% Survival in 100% Effluent
		Survival (TUc)	Reproduction (TUc)		
1st Annual	Aug –Sep 2007	1.0	1.8	>100%	70%
2nd Annual	Aug –Sep 2008	1.83	1.83	87.3%	0%
3rd Annual	Aug –Sep 2009	1.0	1.0	>100%	100%
4th Annual	Aug –Sep 2010	1.0	1.0	>100%	100%
5th Annual	Aug –Sep 2011	1.0	1.0	>100%	100%

Table 3
WETLim10.xls Spreadsheet

Spreadsheet for determination of WET test endpoints or WET limits

	Excel 97			Acute Endpoint/Permit Limit			Use as LC_{50} in Special Condition, as TUa on DMR					
	Revision Date: 01/10/05											
	File: WETLIM10.xls			ACUTE	1.62768671	TUa	LC_{50} =	62	% Use as	1.61	TUa	
	(MIX.EXE required also)			ACUTE WLAa		3.1453039	Note: Inform the permittee that if the mean of the data exceeds					
							this TUa:	1.0	a limit may result using WLA.EXE			
				Chronic Endpoint/Permit Limit			Use as NOEC in Special Condition, as TUc on DMR					
				CHRONIC	16.2768671	TUc	NOEC =	7	% Use as	14.28	TUc	
				BOTH*	31.4530394	TUc	NOEC =	4	% Use as	25.00	TUc	
	Enter data in the cells with blue type:			AML	16.2768671	TUc	NOEC =	7	% Use as	14.28	TUc	
	Entry Date:	08/22/11		ACUTE WLAa,c		31.453039	Note: Inform the permittee that if the mean					
	Facility Name:	Merck Sharpe & Dohme C		CHRONIC WLAc		11.128913	of the data exceeds this TUc:			6.6888918		
	VPDES Number:	VA0002178		* Both means acute expressed as chronic			a limit may result using WLA.EXE					
	Outfall Number:	001										
				% Flow to be used from MIX.EXE			Difuser /modeling study?					
	Plant Flow:	10.86	MGD				Enter Y/N	N				
	Acute 1Q10:	103	MGD	100	%		Acute	1	:1			
	Chronic 7Q10:	110	MGD	100	%		Chronic	1	:1			
	Are data available to calculate CV? (Y/N)			N	(Minimum of 10 data points, same species, needed)					Go to Page 2		
	Are data available to calculate ACR? (Y/N)			N	(NOEC<LC50, do not use greater/less than data)					Go to Page 3		
	IWC_a	9.538029159	%	Plant flow/plant flow + 1Q10			NOTE: If the IWCa is >33%, specify the					
	IWC_c	8.985603177	%	Plant flow/plant flow + 7Q10			NOAEC = 100% test/endpoint for use					
	Dilution, acute	10.48434622		100/IWCa								
	Dilution, chronic	11.12891344		100/IWCc								
	WLA_a	3.145303867	Instream criterion (0.3 TUa) X's Dilution, acute									
	WLA_c	11.12891344	Instream criterion (1.0 TUc) X's Dilution, chronic									
	$WLA_{a,c}$	31.45303867	ACR X's WLA_a - converts acute WLA to chronic units									
	ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)									
	CV-Coefficient of variatio	0.6	Default of 0.6 - if data are available, use tables Page 2)									
	Constants eA	0.4109447	Default = 0.41									
	eB	0.6010373	Default = 0.60									
	eC	2.4334175	Default = 2.43									
	eD	2.4334175	Default = 2.43 (1 samp	No. of sample:	1		**The Maximum Daily Limit is calculated from the lowest					
							LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.					
	$LTA_{a,c}$	12.92545954	WLAa,c X's eA									
	LTA_c	6.688892088	WLAc X's eB							Rounded NOEC's		%
	MDL** with $LTA_{a,c}$	31.45303945	TUc	NOEC =	3.179343	(Protects from acute/chronic toxicity)				NOEC =	4	%
	MDL** with LTA_c	16.27686706	TUc	NOEC =	6.143688	(Protects from chronic toxicity)				NOEC =	7	%
	AML with lowest LTA	16.27686706	TUc	NOEC =	6.143688	Lowest LTA X's eD				NOEC =	7	
	IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a											
										Rounded LC50's		%
	MDL with $LTA_{a,c}$	3.145303945	TUa	LC50 =	31.793430	%				LC50 =	32	%
	MDL with LTA_c	1.627686706	TUa	LC50 =	61.436884	%				LC50 =	62	

DILUTION SERIES TO RECOMMEND

Table 4.	Monitoring		Limit	
	% Effluent	TUc	% Effluent	TUc
Dilution series based on data mean	15.0	6.6888918		
Dilution series to use for limit			7	14.285714
Dilution factor to recommend:	0.3866544		0.2645751	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	38.7	2.59	26.5	3.78
	15.0	6.66	7.0	14.29
	5.8	17.30	1.9	53.99
	2.24	44.74	0.5	204.08
Extra dilutions if needed	0.86	115.71	0.1	771.36
	0.33	299.27	0.0	2915.45

Table 5
Stat.exe Results

Chemical = Acute WET, C.d.
Chronic averaging period = 4
WLAa = 3.1453039
WLAc = NA
Q.L. = 1.0
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 5
Expected Value = 1.118
Variance = .449972
C.V. = 0.6
97th percentile daily values = 2.72056
97th percentile 4 day average = 1.86011
97th percentile 30 day average= 1.34836
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 1.4, 1, 1, 1, 1.19

Chemical = Chronic WET, C.d.
Chronic averaging period = 4
WLAa, = 31.453039
WLAc = 11.128913
Q.L. = 1.0
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 5
Expected Value = 1.326
Variance = .632979
C.V. = 0.6
97th percentile daily values = 3.22671
97th percentile 4 day average = 2.20618
97th percentile 30 day average= 1.59922
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 1.8, 1.83, 1, 1, 1

Chemical = Midpoint Check
Chronic averaging period = 4
WLAa,c = 31.453039
WLAc = 11.128913
Q.L. = 1.0
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 6.66
Variance = 15.9680
C.V. = 0.6
97th percentile daily values = 16.2065
97th percentile 4 day average = 11.0808
97th percentile 30 day average= 8.03231
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are: 6.66

APPENDIX E

PERMIT CHANGES AND BASES FOR SPECIAL CONDITIONS

Tabulated below are the sections of the permit, with any changes and the reasons for the changes identified. Also provided is the basis for each of the permit special conditions.

Cover Page — Content and format as prescribed by the VPDES Permit Manual.

Part I.A.1. **Effluent Limitations and Monitoring Requirements:** Bases for effluent limits provided in previous pages of this fact sheet. Monitoring requirements as prescribed by the VPDES Permit Manual.

Updates Part I.A.1. of the previous permit with the following:

- TRC limits are more stringent than the previous permit.
- Cyanide limits are more stringent than the previous permit.
- Footnote for schedule of compliance removed.
- BOD_5 limits were removed from this outfall.
- The monitoring frequency for BOD_5 and TKN was changed from 1/Week to 1/Month.

Part I.A.2. **Effluent Limitations and Monitoring Requirements:** Bases for effluent limits provided in previous pages of this fact sheet. Monitoring requirements as prescribed by the VPDES Permit Manual.

Updates Part I.A.2. of the previous permit with the following:

- Loading limits for Suspended Solids and COD changed based on production.
- BOD_5 limits were added to this outfall.
- Footnote for 1/6 months sampling frequency added.
- Flow footnote expanded based on permittee request.
- Footnote regarding TRC requirements removed.
- Samplet type for organic parameters was changed from 'composite' to 24 HC for consistency.
- A footnote was added referencing this facility's coverage under the Nutrient General Permit.

Part I.A.3. **Effluent Limitations and Monitoring Requirements:** *New Requirement.* Bases for effluent limits provided in previous pages of this fact sheet. Monitoring requirements as prescribed by the VPDES Permit Manual. 4/Month samples no less than 5 days apart at permittee request based on scheduling.

Part I.A.4. **Effluent Limitations and Monitoring Requirements:** *Identical to Part I.A.3. of the previous permit.* Bases for effluent limits provided in previous pages of this fact sheet. Monitoring requirements as prescribed by the VPDES Permit Manual.

Part I.B. **Additional TRC Limitations and Monitoring Requirements – Outfall 102:** *Updates Part I.B of the previous permit.* Specifies both disinfection and effluent limits and monitoring requirements should the permittee elect to switch from alternate disinfection to chlorine disinfection. Required by Sewage Collection and Treatment (SCAT) Regulations and 9 VAC 25-260-170, Bacteria; other waters. Also, 40 CFR 122.41(e) requires the permittee, at all times, to properly operate and maintain all facilities and systems of treatment in order to comply with the permit. This ensures proper operation of chlorination equipment to maintain adequate disinfection.

Part I.C. **Effluent Limitations and Monitoring Requirements – Additional Instructions:** *Updates Part I.D. of the previous permit*. Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values. BOD_5 QL kept at 5 mg/L at permittee request.

Part I.D. **Whole Effluent Toxicity (WET) Requirements:** *Updates Part I.E. of the previous permit.* VPDES Permit Regulation, 9 VAC 25-31-210 and 220 I, requires monitoring in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act.

Part I.E.1. **95% Capacity Reopener:** *Updates Part I.F.1. of the previous permit.* Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 4 for certain permits. Included for this facility to ensure that adequate treatment capacity will continue to be provided as influent flows and/or loadings increase. Permittee requested a longer window before >95% flows trigger a plan of action for growth. This was based on the nature of the discharge and the fact that the facility LTA flow has for many years been around 1.0 MGD although it is not unusual for the monthly average flows to approach the 1.2 MGD DAF. LTA flow is not increasing and the facility functions well at existing flow levels.

Part I.E.2. **Materials Handling/Storage:** *Identical to Part I.F.3. of the previous permit.* 9 VAC 25-31-280.B.2. requires that the types and quantities of "wastes, fluids, or pollutants which are … treated, stored, etc." be addressed for all permitted facilities.

Part I.E.3. **O&M Manual Requirement:** *Updates Part I.F.4. of the previous permit.* Code of Virginia at 62.1-44.16, VPDES Permit Regulation 9 VAC 25-31-190 E, and 40 CFR 122.41(e) require proper operation and maintenance of the permitted facility. Added requirement to describe procedures for documenting compliance with the permit requirement that there shall be no discharge of floating solids or visible foam in other than trace amounts.

Part I.E.4. **Concept Engineering Report (CER) Requirement**: *New requirement.* 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade

Part I.E.5. **Sludge Management Plan:** *Updates Part I.F.6. of the previous permit.* VPDES Permit Regulation 9 VAC 25-31-100 P, 220 B 2, and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on their sludge use and disposal practices and to meet specified standards for sludge use and disposal. Technical requirements are derived from the Virginia Pollution Abatement Permit Regulation (9 VAC 25-32-10 *et seq.*).

Part I.E.6. **Licensed Operator Requirement:** *Identical to Part I.F.7. of the previous permit.* The VPDES Permit Regulation 9 VAC 25-31-200 C, the Code of Virginia 54.1-2300 et seq., and Rules and Regulations for Waterworks and Wastewater Works Operators 18 VAC 160-20-10 et seq., require licensure of operators. A class II license is indicated for this facility.

Part I.E.7. **Water Quality Criteria Monitoring:** *Updates Part I.F.8. of the previous permit.* State Water Control Law at 62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. States are required to review data on discharges to identify actual or potential toxicity problems, or the attainment of water quality goals, according to 40 CFR Part 131, Water Quality Standards, subpart 131.11. To ensure that water quality criteria are maintained, the permittee is required to analyze the facility's effluent for the substances noted in Attachment A of this VPDES permit.

Part I.E.8. **Reopeners:**
Updates Part I.F.13. of the previous permit: a. Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The reopener recognizes that, according to section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under section 303 of the Act.

New Requirement: b. 9 VAC 25-40-70 A authorizes DEQ to include technology-based annual concentration limits in the permits of facilities that have installed nutrient control equipment, whether by new construction, expansion or upgrade.

Updates Part I.F.12. of the previous permit: c. 9 VAC 25-31-390 A authorizes DEQ to modify VPDES permits to promulgate amended water quality standards.

Updates Part I.F.5. of the previous permit: d. Required by the VPDES Permit Regulation, 9 VAC 25-31-220.C, for all permits issued to STPs.

Part I.E.9. **Notification Levels**: *Updates Part I.F.2. of the previous permit.* Required by the VPDES Permit Regulation 9 VAC 25-31-200 A for all manufacturing, commercial, mining, and silvicultural dischargers.

Part I.E.10. **Additional Instructions for pH:** *Identical to Part I.F.9. of the previous permit.* Condition necessary to define compliance given continuous pH monitoring.

Part I.E.11. **Additional Instructions for Temperature:** *Identical to Part I.F.10. of the previous permit.* Condition necessary to define compliance given continuous temperature monitoring.

Part I.E.12. **Cooling Water and Boiler Additives:** *Identical to Part I.F.11. of the previous permit.* State Water Control Law at 62.1-44.21 authorizes the Board to request information needed to determine the discharge's impact on State waters. States are required to review data on discharges to identify actual or potential toxicity problems, or the attainment of water quality goals, according to 40 CFR Part 131, Water Quality Standards, subpart 131.11.

Part I.F. **General Storm Water Special Conditions** : *Updates Part I.G., Part I.H., & Part I.I. of the previous permit.* VPDES Permit Regulation 9 VAC 25-31-10 defines discharges of storm water from industrial activity in 9 industrial categories. 9 VAC 25-31-120 requires a permit for these discharges. The Storm Water Pollution Prevention Plan requirements of the permit are derived from the VPDES general permit for discharges of storm water associated with industrial activity, 9 VAC 25-151-10 et seq. VPDES Permit Regulation, 9 VAC 25-31-220 K, requires use of best management practices where applicable to control or abate the discharge of pollutants when numeric effluent limits are infeasible or the practices are necessary to achieve effluent limit or to carry out the purpose and intent of the Clean Water Act and State Water Control Law.

Part II **Conditions Applicable to All VPDES Permits:** *Updates Part II of the previous permit.* VPDES Permit Regulation 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed. Part II,A.4. language added for Virginia Environmental Laboratory Accreditation Program (VELAP) per 1 VAC 30, Chapter 45: Certification for Noncommercial Environmental Laboratories, and 1 VAC 30, Chapter 46: Accreditation for Commercial Laboratories.

DELETIONS

Tabulated below are the sections of the previous permit that were deleted and the basis for this action.

Part I.C. **Schedule of Compliance:** This requirement was fulfilled and has been removed at this reissuance.